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ABSTRACT

In spring 1994, the North American Association for Environmental Education (NAAEE) Board of Directors approved a recommendation that the Association take the lead in establishing standards for environmental education. The four working papers contained in this publication are the first step in the NAAEE Standards Project. The papers discuss the importance and need for environmental education standards, review what has been done in the past, and propose a framework of actual preparation of standards in three key areas: (1) student performance; (2) educator performance; and (3) education materials. This project will facilitate the development of a model set of national standards for environmental education. The papers are as follows: (1) "Developing National Standards for Environmental Education: Context and Scope"; (2) "Developing a Framework for National Environmental Education Standards"; (3) "Developing a Framework for National Environmental Educator Performance Standards"; and (4) "Proposed National Environmental Education Materials Development Standards." Chapter subareas include developing a framework for Standards, guidelines based on environmental education literature, and synthesis of guidelines. The paper on educator standards also addresses state-level certification or endorsement requirements. The paper on education materials covers guidelines for curriculum review as well as for materials development and use. (PVD)

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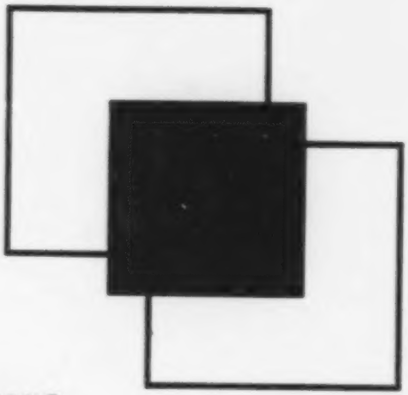
ED 406 177

THE NAAEE STANDARDS PROJECT:

Papers on the Development of Environmental Education Standards



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INTRODUCTION
to the
NAAEE STANDARDS PROJECT

In the spring of 1994, the NAAEE Board of Directors approved a recommendation that the Association take the lead in establishing standards for environmental education. Over the years, NAAEE has worked on several projects related to the development of standards and has cooperated with standards setting initiatives in other areas of education. Indeed, many past and present Board members have conducted the research and prepared the papers that will provide the conceptual and practical foundation upon which environmental education standards will rest. However, the recent Board action signaled that NAAEE intends to devote considerable time and resources to a comprehensive, long-term project in this area.

The four working papers contained in this publication are the first step in the NAAEE Standards Project. The papers provide a discussion of the importance and need for environmental education standards, review what has been done in the past, and propose a framework of actual preparation of standards in three key areas.

During the summer and early fall of 1994, NAAEE circulated a draft version of these working papers widely for review and comment. Of particular interest were comments on the scope of the project and its overall direction. In addition, comments were solicited concerning the degree to which the papers represented fairly and accurately the field of environmental education. Based on comments received, NAAEE revised the working papers and will use them as the main conceptual framework and work plan for its overall Standards Project.

Further comments concerning the Standards Project and/or this document are welcomed. Written feedback can be sent directly to NAAEE for use in subsequent phases of the project. Or, you may want to discuss comments directly with the author of these papers, Dr. Deborah Simmons. Dr. Simmons can be reached by writing her at the Department of Curriculum and Instruction, Faculty of Outdoor Teacher Education, Northern Illinois University, Dekalb, IL 60115 or by phone: (815) 753-0205.

THE NORTH AMERICAN ASSOCIATION for ENVIRONMENTAL EDUCATION

Since its beginning in 1971, the North American Association for Environmental Education has been dedicated to promoting environmental education and supporting the work of environmental educators around the world. NAAEE is an integrated network of professionals in the field of environmental education with membership throughout North America and in 40 additional countries.

There are many environmental interest groups, and many organizations dedicated to the improvement of education. NAAEE uniquely combines and integrates both of these perspectives. NAAEE is deeply committed to environmental education, but it is not a partisan advocacy organization. Its approach to promoting environmental education is neither confrontational nor adversarial.

NAAEE recognizes the need for a coherent body of information about environmental issues, but its members also recognize that information and analysis are only part of an effective education program. To be truly effective, this body of knowledge must be integrated into all aspects of the curriculum and into all types of educating institutions for the widest array of audiences.

The Association is made up of people who have thought seriously—over lifetimes—about how people become literate concerning environmental issues. NAAEE members believe education must go beyond consciousness-raising about these issues. It must prepare people to think together about difficult decisions they must make concerning environmental stewardship and to work together towards resolution of environmental problems.

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Working Paper #1

Developing National Standards for Environmental Education: Context and Scope

PREFACE

This is the first in a series of working papers written as part of the National Standards for Environmental Education Project. This project, sponsored by the North American Association for Environmental Education (NAAEE), will facilitate the development of a model set of national standards for environmental education. As such, it joins the many on-going standards development projects for such disciplines as English, Geography, Science and History initiated in response to the America 2000 National Education Goals.

This particular document provides a short background to the America 2000 process and its relationship to environmental education and an overview of the standards development process, including a statement of purpose for the National Standards for Environmental Education Project. The intention of this discussion paper is to provide a context for the development of EE standards and to establish the scope of the project.

I. WHAT ARE STANDARDS AND WHY ARE THEY IMPORTANT?

The current push toward education reform in the U.S. was heralded by the publication, in 1983, of A Nation at Risk. Pointing to declining test scores, poorly prepared high school graduates, declining enrollment in science and mathematics, low academic achievement in comparison to many European and Japanese students, and low levels of literacy, significant questions concerning the quality of the American educational system were raised. Following the publication of A Nation at Risk, a number of major works (see Goodlad, Holmes Group, Carnegie) called into question the very structure of American education, each proposing strategies for improvement.

A decade long move toward national education reform received its highest level of governmental recognition at the 1989 national education summit in Charlottesville. At the summit, a bipartisan group of the nation's governors, led by then Governor Bill Clinton, hammered out six national goals for education with the Bush White House.

These six, broadly formulated goals, set out an agenda for education for the year 2000. Although there has been a great deal of debate concerning the degree to which these goals are achievable, they have been widely accepted. The national goals are "based on the premise that every child can learn and that education is a lifelong process. The following summarizes the goals (National Education Goals Report, 1993):

GOAL 1: READINESS FOR SCHOOL - By the year 2000, all children in America will start school ready to learn.

GOAL 2: HIGH SCHOOL COMPLETION - By the year 2000, the high school graduation rate will increase to at least 90 percent.

GOAL 3: STUDENT ACHIEVEMENT AND CITIZENSHIP - By the year 2000, American students will leave grades four, eight, and twelve having demonstrated competency in challenging subject matter, including English, mathematics, science, history, and geography; and every school in America will ensure that all students learn to use their minds well, so they may be prepared for responsible citizenship, further learning, and productive employment in our modern economy.

GOAL 4: SCIENCE AND MATHEMATICS - By the year 2000, U.S. students will be first in the world in science and mathematics achievement.

GOAL 5: ADULT LITERACY AND LIFELONG LEARNING - By the year 2000, every adult American will be literate and will possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship.

GOAL 6: SAFE, DISCIPLINED, AND DRUG-FREE SCHOOLS - By the year 2000, every school in America will be free of drugs and violence and will offer a disciplined environment conducive to learning.

With the passage of the Goals 2000: Educate America Act these six statements, plus the following two goals added in House/Senate conference, become official national policy, guiding numerous activities in and out of the federal government.

GOAL 7: The Nation's teaching force will have access to programs for continued improvement of their professional skills and the opportunity to acquire the knowledge and skills needed to instruct and prepare all American students for the next century.

GOAL 8: Every school will promote partnerships that will increase parental involvement and participation in promoting the social, emotional, and academic growth of children.

Of particular significance is the development of national standards as proposed in Goal #3. The development of standards will, in a very real sense, define educational content in the United States. According to President Clinton (1992), "we should have national standards for what our children should know at the fourth, eighth, and 12th grades in math, science, language, geography, history, and other subjects..." The core subjects of schooling, the basics, are being defined and redefined by the America 2000 process. What children should know is being specified by the standards. In addition, an integral part of America 2000 would be the development of a system for national assessment. President Clinton (1992) proposed that "we should have a meaningful set of national exams to measure whether they know what they're supposed to know."

It was in this context that the NAAEE Board of Directors approved, as part of the 1994 annual work plan, a new initiative geared toward the production of a model set of standards for environmental education.

II. WHY SHOULD WE HAVE ENVIRONMENTAL EDUCATION STANDARDS?

Environmental education should be an integral part of every student's schooling. Infused throughout the curriculum, environmental education supports the high standards set by the traditional disciplines. More importantly, environmental education encompasses the knowledge, skills, and inclinations that are essential to maintaining an equilibrium between quality of life and quality of the environment. Environmental education can play a particularly critical role in meeting Goal #3, "Student Achievement and Citizenship," which asserts that "by the year 2000 ... every school in America will ensure that all students learn to use their minds well, so they may be prepared for responsible citizenship."

Environmental education can also play a significant role in reaching Goal #4: Science and Mathematics. Through hands-on, study of natural systems, environmental education has long been an integral component of science learnings. A comprehensive, cohesive environmental education program will enhance the development of science process skills, the understanding of concepts, and provide an opportunity for applying science learnings within a real world context.

Finally, recent projections suggest that job opportunities within environment-related fields are growing and will continue to grow well into the next century. Environmental education programs, by ensuring that students are prepared to take on these challenges, can help the nation meet Goal #5 which insists that "every adult American ... will possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship."

We know, however, that currently the implementation of environmental education nationwide is inconsistent at best. Standards would provide students, parents and educators a set of common guidelines, an understanding of what all students should know and be able to do. Standards provide focus and direction. By defining what is valued, they facilitate a quality education that is equitable, coherent, and efficient.

III. WHAT WILL STANDARDS FOR ENVIRONMENTAL EDUCATION INCLUDE?

The standards already under development by the various discipline based groups (e.g. National Council of Geographic Education, National Center for History in the Schools) do, to one degree or another, address environmental education interests. However, these standards are not comprehensive, nor do they provide a unified voice for environmental education. Consequently, through a critique and consensus process, NAAEE will take the lead by developing a model set of national standards for environmental education.

Given the unique character of environmental education, three complementary sets of standards will be developed:

A. Environmental Education Materials Standards

These standards will provide guidelines for the development and evaluation of EE curriculum materials. Building off of the Environmental Education Materials Guidelines for Development proposed by NAAEE (Second Draft) and other documents these standards will outline the qualities that all curricula should possess (e.g. be free of cultural, racial, and gender biases; be factually accurate; involve the learner in the educational process and focus on analysis and problem solving; be organized in an easy-to-use fashion).

B. Student Performance Standards for Environmental Education

These standards will delineate what students should know and be able to do with their knowledge. Standards are defined typically in terms of both content and performance. Content standards lay out the knowledge, skills, and understandings all students should have in order to attain high levels of competency. These content level standards need to be challenging, but at the same time, to be effective, they should focus on describing essential knowledge and skills. Performance standards provide the scale upon which proficiency is measured and typically define set levels of mastery geared to appropriate grade levels.

C. Educators Performance Standards

The standards developed for this portion of the project will focus on the skills and knowledge needed by environmental educators. It is anticipated that many of the standards will reflect "good practice" regardless of the setting or content. They will attempt to describe what environmental educators need to do to provide meaningful environmental education experiences. The standards will be used to inform the design of pre-service and professional development programs for environmental education. The teacher standards currently being written by the National Science Education Standards and the National Standards for Civics and Government projects will be of particular use in the development of this section.

IV. WHAT PRINCIPLES GUIDE THIS PROCESS?

It is important to outline in more depth what the standards development process is and what it is not. To a great degree, the Technical Planning Group for the National Education Goals Panel (1993) delineated this well with ten critical principles, asserting that standards should be:

A. World Class

Standards should be of high quality, competitive, and challenging.

B. Important and Focused

Standards should focus upon a limited set of the most important knowledge and skills.

C. Useful

Standards should address the needs of employers, communities, and post-secondary education. They should promote the development of the knowledge, skills, and work habits that employers, communities and universities require. They should also demonstrate to educators and the general public that more will be expected of students and that the standards will help everyone meet the fundamental goals of schooling and prepare them for the requirements of a modern post-industrialized nation.

D. Reflective of Broad Consensus Building

Standards should result from a reasonable and inclusive process.

E. Balanced

Standards should represent a measured and acceptable balance on a set of enduring dimensions or polarities; for example, breadth should be balanced against depth; formal knowledge of theory and facts should be balanced against activities, performances, and applications of knowledge.

F. Technical Merit within the Discipline

Standards should accurately reflect the current state of scholarship in the discipline.

G. Clear and Usable

Standards should be sufficiently clear so students, teachers, and parents using them understand what they mean and require.

H. Assessable

Standards should be sufficiently specific so their attainment can be measured.

I. Adaptable and Flexible or Respectful of Diversity

Standards should define the common core that all students must know and be able to do. All students should be expected to reach high standards, but these standards should provide enough flexibility for implementation to accommodate state and regional differences, local control of education, differing individual student interests, and the value of the mosaic of cultural traditions in the United States.

J. Developmentally Appropriate

EE standards should support and challenge the conceptual growth of standards in other disciplines. The standards should be suitable to and within the capabilities of students to learn. Regardless of students' perceived ability, the standards should be achievable with sustained effort.

It must be stated explicitly what the standards will not do. The standards are voluntary, and therefore do not define a national curriculum. Although standards outline the core ingredients for quality environmental education, they do not prescribe how EE will be taught at the state or local level. Educators, community members and parents will continue to develop locally appropriate curricula, using the standards as guidelines against which they can monitor the quality of their children's education.

V. HOW WILL THE STANDARDS BE DEVELOPED?

NAAEE will develop, through a process of critique and consensus, a model set of voluntary national standards for environmental education. The standards will cover three interrelated areas: 1) EE Materials Standards 2) Student Performance Standards and 3) Environmental Educator Performance Standards. These standards will clearly state what students and educators should know and what they should be able to do regarding environmental education. The standards will encompass curriculum content and performance objectives. The Environmental Education Standards will help schools meet Goals #3, #4, and #5 of the National Education Goals (Student Achievement and Citizenship, Science and Mathematics, and Adult Literacy and Lifelong Learning) by paying particular attention to the development of the ability to solve problems, apply knowledge, and write and communicate effectively. These standards will also address the need for students to be involved in activities that promote and demonstrate responsible citizenship.

VI. DEVELOPING STANDARDS THROUGH CRITIQUE AND CONSENSUS

The project will follow a critique and consensus process for the development of standards that is consistent with the recommendations of the National Education Goals Panel. Draft documents will be developed for review by a central writing team. As materials are prepared they will be provided to a wide circle of audiences for critique:

A. Advisory Group

A national advisory group will be formed which will oversee the work of the writing team. The advisory group will be made up of representatives from education, environmental groups, business, industry, government, and environmental education.

B. Review Teams

Review teams will be formed representing various interests (e.g. state level curriculum coordinators, NAAEE sections, EE affiliates, other EE organizations, other education organizations, business and industry representatives, government representatives). Each team will be asked to critique documents and provide feedback.

C. NAAEE Membership

Documents will be made available directly to the NAAEE membership for review and critique. Members will be updated on the progress of the project through the "Environmental Communicator." Individual members interested in reviewing materials will be solicited through sections and the newsletter.

D. Public Forums

Draft documents will be presented during the NAAEE annual conference and when appropriate, at other conferences and environmental education meetings. Those in attendance will be invited to provide feedback to the writing team.

E. Interested Individuals

Individuals requesting documents will be encouraged to provide written feedback.

The development of environmental education standards is intended to be an open process. Comments and suggestions will be welcomed and carefully considered. When consensus has been formed, application will be made to the National Education Goals Panel for certification of the environmental education standards as national standards.

Working Paper #2

Developing a Framework for National Environmental Education Standards

Preface

This paper presents an examination of existing EE frameworks and models and a synthesis of these models that will help to guide the development of standards. The purpose is to provide a review of the relevant literature for the development of standards and a beginning framework for discussion. Primarily, this paper will serve as a background document for the development of both the Student Performance Standards and the Environmental Educator Performance Standards. To the extent that content issues are included in the development of EE Materials Standards, this document will be relevant to that process also.

I. DEVELOPING A FRAMEWORK FOR THE STANDARDS

Any discussion of the foundations of environmental education would be remiss if it did not acknowledge the significant contributions of the Belgrade Charter (1975) and the Tbilisi Declaration (1977). These two documents furnish an internationally accepted blueprint for environmental education. The Belgrade Charter set forth a goal for environmental education, and as such, provides a widely endorsed vision statement which can be used as a guidepost:

> The goal of environmental education is to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones.

The Tbilisi Declaration further delineated a set of goals for environmental education:

> To foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas;
>
> To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment;
>
> To create new patterns of behavior of individuals, groups and society as a whole towards the environment.

Finally, the Tbilisi Declaration outlined five categories of objectives for environmental education:

> Awareness - to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems.
>
> Knowledge - to help social groups and individuals gain a variety of experiences in, and acquire a basic understanding of, the environment and its associated problems.

Attitudes - to help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection.

Skills - to help social groups and individuals acquire the skills for identifying and solving environmental problems.

Participation - to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward the resolution of environmental problems.

Environmental education enjoys a rich history and literature. Much of the work has been guided by the Belgrade Charter and the Tbilisi Declaration. With the evolution of the field, these guiding principles have been researched, critiqued, revisited, and expanded. As such, standards must draw upon our best thinking to date. To facilitate discussion, proposed frameworks developed since Tbilisi will be divided into those: based on research or a synthesis of the research literature; created as conceptual frameworks for curricula; and developed as part of previous standards or criteria development projects. To re-create some of the historical logic of the field, the models will be presented in chronological order within each category.

II. FRAMEWORKS/MODELS BASED ON EE LITERATURE

Since the publication of the Tbilisi Declaration in 1977, the field has continued to mature, maintaining the declaration's intent, but also elaborating on and fine tuning its design. Although the environmental education model proposed by Stapp and Cox (1974) predates Tbilisi, it is important to include here because of the central role it played in the development of the Tbilisi Declaration. The work by Hungerford, et al (1980), proposing goal levels for EE curriculum development, is closely tied to the Tbilisi objectives. The four goal levels were submitted to a content validity expert panel to judge their congruence with the five Tbilisi objectives. In recent years, the focus of much scholarly work in EE has been on describing the precursors of responsible environmental citizenship and environmental literacy. As such, the proposed frameworks offered by Iozzi, et al (1990), Marcinkowski (1991), Wisconsin Center for Environmental Education (1992), Roth (1992), and the EE Literacy Consortium (1994) are all based in a synthesis of this research and foundations literature. Finally, the important influence of issues surrounding sustainable development on EE thinking is considered with the inclusion of a framework for sustainable development education published in Canada (1994).

A. Stapp, W.B. & Cox, D.A.
Environmental Education Model
Environmental Education Activities Manual (1974)

I. Philosophy and Concepts

An environmental education program should assist the learner in understanding the basic spaceship earth philosophy which would serve as an "umbrella" of thought and ethic for the entire program. The spaceship earth philosophy has been divided into five basic concepts: ecosystems, population, economics and technology, environmental decisions, and environmental ethic. These concepts encompass the awareness, knowledge, and understanding of the living and non-living world and their complex interactions; the social, economic, political and aesthetic influences of the populations of people; the need for, and processes of decision making; and development of an environmental ethic which would motivate the learner to adopt a life style compatible with environmental quality.

II. The Processes

A. The Skills of Problem Solving

Since the environmental education model is based on student involvement, problem solving skills are essential to developing and carrying out action plans.

... the eight problem solving skills:

1. Recognizing environmental problems
2. Defining environmental problems
3. Listening with comprehension
4. Collecting information
5. Organizing information
6. Analyzing information
7. Generating alternative solutions
8. Developing a plan of action

B. Clarifying Values

The values clarification approach helps students become aware of personal beliefs, attitudes, values and behavior which they prize and are committed to both in and out of the classroom. This process assists students in considering alternative solutions and the implications of each alternative. ... Values clarification is of major importance in making rational environmental decisions every day of a person's life, and must be a basic part of every environmental education program.

C. Community Problem Solving

Students need to be able to apply learned skills in both valuing and problem solving to an issue that is meaningful to them - a problem that directly affects them either at home, or at school, or in the local community.

III. The Teaching-Learning Models

There is no single teaching model that all students will respond favorably toward under all circumstances. ... It is important for a teacher to assess his/her personal skills and the situation and then blend teaching models in an effort to achieve the best learning environment. ... The role of the teacher would be to create a learning environment, assist students in acquiring information, provide guidance to the student, and to participate with the student in the learning process.

IV. Emphasis of Program at Different Age Levels

Environmental education activities at each grade level should focus on the feeling (affective), knowing (cognitive) and skill-behavior domains. Emphasis in the early years, however, should be on awareness and feelings and in later years on knowledge and skill-behavior. The learner should also be provided with opportunities to explore his immediate environment with all of his senses -- sight, hearing, smell, touch and taste. The learner should be exposed to a variety of physical and social environments in order to have experiences to judge the quality of his immediate environment.

B. Hungerford, H.R., Peyton, R.B., & Wilke, R.
Goals for curriculum development in environmental education
Journal of Environmental Education (1980)

GOALS FOR CURRICULUM DEVELOPMENT IN ENVIRONMENTAL EDUCATION

GOAL LEVEL I: The Ecological Foundations Level

Upon completion of instruction in environmental education, the learner should be expected to be able to...

1.... communicate and apply the major ecological concepts including those focusing on individuals, species populations, communities, ecosystems, biogeochemical cycles, energy production and transfer, interdependence, niche, adaption, succession, homeostasis, and man as a ecological variable.

2.... apply a knowledge of ecological concepts to the analysis of environmental issues and identify important ecological principles involved.

3.... apply a knowledge of ecological concepts in predicting the ecological consequences of alternative solutions to environmental problems.

4.... understand the principles of ecology in order to identify, select and utilize appropriate sources of scientific information in a continuing effort to investigate, evaluate and find solutions for environmental issues.

GOAL LEVEL II: The Conceptual Awareness Level

5.... understand and communicate how man's cultural activities (e.g., religious, economic, political, social and others) influence the environment from an ecological perspective.

6.... understand and communicate how an individual's behaviors impact on the environment from an ecological perspective.

7.... identify a wide variety of local, regional, national and international environmental issues and the ecological and cultural implications of these issues.

8.... identify and communicate the viable alternative solutions available for remediating crucial environmental issues as well as the ecological and cultural implications of these various solutions.

9.... understand the need for environmental issue investigation and evaluation as prerequisite to sound decision making.

10.... understand the roles played by differing human beliefs and values in environmental issues and the need for personal values clarification as an important part of environmental decision making.

11.... understand the need for responsible citizenship action in the solution of environmental issues.

GOAL LEVEL III: The Investigation and Evaluation Level

12.... apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered,

13.... demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

14.... demonstrate the ability to identify alternative solutions for important issues and the value perspectives associated with these solutions.

15.... demonstrate the ability to evaluate alternative solutions and associated value perspectives for important issues with respect to their ecological and cultural implications.

16.... demonstrate the ability to identify and clarify personal value positions related to important environmental issues and their associated solutions.

17.... demonstrate the ability to evaluate, clarify, and change value positions in light of new information.

GOAL LEVEL IV: The Issue Resolution Skill Level

18.... demonstrate a competence with a variety of citizenship action skills from the following categories of skills: persuasion, consumerism, political action, legal action, and ecomanagement.

19.... evaluate selected actions in light of their ecological and cultural implications.

20.... demonstrate the ability to apply one or more citizenship action skills for the purpose of resolving or helping to resolve one or more environmental issues.

C. **Iozzi, Louis; Laveault, Dany; Marcinkowski, Thomas**
Assessment of Learning Outcomes in Environmental Education
UNESCO March 1990

Organization of Learning Outcomes According to Taxonomies of Educational Objectives

COGNITIVE DOMAIN

Knowledge: of ecology, environmental problems and issues, and environmental action strategies

Skills for dealing with action strategies: including identification, investigation, and analysis of issues

Skills for dealing with action strategies: including selecting appropriate action strategies, creating an action plan, evaluating an action plan, and implementing an action plan

AFFECTIVE DOMAIN

Environmental sensitivity or appreciation: including 'the characteristics that result in an individual viewing the environment from an empathetic perspective' (Peterson, 1982)

Attitudes: towards pollution, technology, economics, conservation, and environmental action

Values: a preference for selected means and ends; values such as a healthy environment and a peaceful world

Moral reasoning: making decisions and judgments about environmental issues according to one's own sense of morality

Ethics: involving the evaluation of a personal world view which reflects a balance between the quality of life and the quality of the environment

RESPONSIBLE ENVIRONMENTAL BEHAVIOR

Active participation aimed at solving problems and resolving issues: environmentally sound consumer purchasing, methods for conserving resources, assisting with the enforcement of environmental regulations, using personal and interpersonal means to encourage environmentally sound practices, and encouraging environmentally sound policies and legislative initiatives

LOCUS OF CONTROL

Individual's sense that he or she can manifest some influence upon or control over the outcomes of a specific activity

ASSUMPTION OF PERSONAL RESPONSIBILITY

Recognition that one's negative behavior has a negative effect on the environment and, likewise, one's positive behavior can have potentially positive effects on the environment

Acceptance of personal responsibility for negative environmental effects or impacts, and for one's own role in helping to resolve environmental impacts and issues

Willingness to help correct negative environmental impacts, and a concomitant willingness to help resolve environmental impacts and issues

D. **Marcinkowski, T.**
The relationship between environmental literacy and responsible environmental behavior in environmental education. In M. Maldague (ed.) Methods and techniques for evaluating environmental education.
Paris: UNESCO (1991)

Environmental literacy involves:

a. An awareness and sensitivity toward the environment

b. An attitude of respect for the natural environment, and of concern for the nature and magnitude of human impacts on it

c. A knowledge and understanding of how natural systems work, as well as of how social systems interface with natural systems

d. An understanding of the various environmentally-related problems and issues (local, regional, national, international, and global).

e. The skills required to analyze, synthesize, and evaluate information about environmental problems/issues using primary and secondary sources, and to evaluate a select problem/issue on the basis of evidence and personal values.

f. A sense of personal investment in, responsibility for, motivation to work individually and collectively toward the resolution of environmental problems/issues.

g. A knowledge of strategies available for use in remediating environmental problems/issues.

h. The skills required to develop, implement and evaluate single strategies and composite plans for remediating environmental problems/issues.

i. Active involvement at all levels in working toward the resolution of environmental problems/issues.

E. **Wisconsin Center for Environmental Education**
University of Wisconsin, Steven's Point (October 1992)

COGNITIVE OUTCOMES

Knowledge of Ecological Principles

Individuals, Populations, and Communities (habitats, niches, and adaptations; food chains, food webs; population dynamics; population and community interactions)

Change and Limiting Factors (change as a natural process; biotic and abiotic limits to growth, size, and distribution of populations)

Energy Flow (sun as primary source, other sources and forms of energy; transfer and energy through living systems; first and second laws of energy - conservation of energy, entropy; need for a consistent source of energy by systems and individuals; photosynthesis and respiration

Biogeochemical Cycling (conservation of matter, nutrient and materials cycling; hydrologic cycle

Ecosystems and Biodiversity (importance of biodiversity; interdependence of organisms; ecosystems

Knowledge of Environmental Problems and Issues

Air Quality (ozone depletion; global warming; acid deposition; sir pollution

Water Quality and Quantity (water pollution; use and management

Soil Quality and Quantity (soil depletion and pollution; use and management)

Wildlife and Habitat (habitat and biodiversity loss; use and management)

Energy (sustainable and non-renewable; consumption)

Human Population and Health (overpopulation; environmental health hazards)

Waste (solid waste; hazardous wastes)

Knowledge of Environmental Issue Investigation and Action Strategies

Knowledge of strategies used to investigate environmental problems and issues

Knowledge of appropriate action strategies for the prevention or resolution of environmental problems and issues

AFFECTIVE OUTCOMES

Environmental Sensitivity/Awareness

Positive Attitudes and Values for the Prevention and Remediation of environmental Problems and Issues Regarding: Air Quality; Water Quality and Quantity; Soil Quality and Quantity; Wildlife and Habitat; energy; Human Population and Health; Waste

DETERMINANTS OF ENVIRONMENTALLY RESPONSIBLE BEHAVIOR

Locus of Control

Assumption of Personal Responsibility

ENVIRONMENTALLY RESPONSIBLE BEHAVIORS

Ecomanagement; Economic Action; Persuasion; Political Action; Legal Action

E. **Roth, Charles**
Environmental Literacy: Its Roots, Evolution and Directions in the 1990s
ERIC/CSMEE, Ohio State University (September 1992)

Roth provides a basic framework for environmental literacy (i.e., knowledge, affect, skills, behavior). Further, he suggests three levels of competence (i.e., nominal, functional, and operational environmental literacy).

NOMINAL ENVIRONMENTAL LITERACY

Knowledge Strand - Nominally environmentally literate individuals are familiar with:

- The nature of the basic components of elemental systems (e.g. living and non-living things, requirements for life).
- Types and examples of interactions between humans and nature.
- Basic components of societal systems.

Affect Strand - have affective sensitivities about:

- Appreciation of both nature and society.
- Elementary sensitivity and empathy for both nature and society
- Elemental perceptions of points of conflict between nature and society

Skill Strand - have skills of:

- Identifying and defining problems.
- Recognizing issues surrounding identified problems or proposed solutions (e.g. latent and visible conflicts).

Behavior Strand - demonstrate:

- Familial, school and youth organization activities and habits aimed at maintenance of environmental quality.
- Responding and coping behaviors.

FUNCTIONAL ENVIRONMENTAL LITERACY

Knowledge Strand - The functional environmentally literate citizen, in addition to the knowledge of the nominally literate, has knowledge of and understanding of a number of ecological, economic, geographic, religious, educational and political processes and understanding of the effects/impacts of humans on natural systems, including (abbreviated listing):

- population dynamics
- Interactions
- Interdependence
- Thinking in terms of time frames or scales

Skill Strand - The functionally environmentally literate demonstrate basic skills in analyzing problems and issues and conducting investigations of problems and issues using primary and secondary resource/strategies such as (ab. listing):

- Identifying environmental issues
- Seeking historical background of issues
- Investigating environmental issues
- Evaluating sources of information
- Analyzing environmental issues from various perspectives
- Applying ecological concepts to predicting probable ecological consequences
- Identifying alternative solutions and value perspectives
- Evaluating alternative solutions
- Conducting basic risk analysis
- Identifying and clarifying his/her value positions
- Examining issues from local, national, regional, and international points of view
- Thinking in terms of systems
- Demonstrating ability to forecast, to think ahead, plan

Affect Strand - The functionally environmentally literate demonstrate such basic affects, attitudes and values as:

- identification with, and feelings of concern for, both society and the environment

- willingness to recognize and choose among differing value perspectives associated with problems and issues
- internal locus of control
- treating public and private property with equal respect
- sense of stewardship

Behavior Strand - The functionally environmentally literate moves to action through selected lifestyle activities/behaviors and community/organizational behaviors demonstrated by:

- taking action positions and actions based on best available knowledge
- taking individual and/or group action through: persuasion, consumerism, political action, legal action, ecomanagement

OPERATIONAL ENVIRONMENTAL LITERACY

Skill Strand - Skills involved with evaluating problems and issues on the basis of available evidence (facts) and personal values and skills used in planning, implementing, and evaluating solutions, including:

- using the process skills of scientific inquiry
- using ability to forecast, to think ahead, plan
- using ability to separate number, quantity, quality, and value
- imagining
- connecting
- valuing and value analysis
- using primary and secondary sources of information
- using ability to separate fact from opinion
- determining the roles played by differing human beliefs and values in environmental issues

Affect Strand - Affects, attitudes and values, that indicate a valuation of both nature and society, a sense of investment in and responsibility for the resolution of problems and issues along with a respect for both nature and society and a willingness to participate in, and show a sense of efficacy toward the resolution of problems and issues including (abbreviated listing):

- awareness of and sensitivity to the total environment and its allied programs
- motivation to actively participate in environmental improvement and protection
- taking into account historical perspectives while focusing on current and potential environmental situations
- strong internal locus of control

- personal responsibility: recognition of impacts of personal behavior; acceptance of personal responsibility for the impacts; willingness to help correct or avoid negative impacts

Behavior Strand - Actions that demonstrate leadership in working toward the resolution of problems and issues including:

- Evaluating actions with respect to their impact on quality of life and environment
- providing verbal commitments
- working to maintain biological and social diversity
- continually examining and reexamining the values of the culture
- making decisions based on beneficence, justice, stewardship, prudence, cooperation, and compassion

G. **Environmental Education Literacy Consortium (Hungerford, H.; Volk, T.; Wilke, R.; Champeau, R.; Marcinkowski, T.; May, T.; Bluhm, B.; and McKeown-Ice, R.)**
Environmental Literacy Framework (April 1994)

COGNITIVE DIMENSIONS (KNOWLEDGE AND SKILLS)

A. knowledge of ecological and socio-political foundations

Ecological foundations have been extensively developed and are consistently revisited in different parts of the country. However, socio-political foundations are in their "developing stages." Though in need of refinement, their importance is increasingly recognized in the EE field. If one bases decisions solely upon knowledge of ecological foundations without the complement of socio-political ramifications, significant errors are possible.

B. knowledge of and ability to identify, analyze, investigate and evaluate environmental problems and issues

Both this point and the next two imply the need for skills such as critical thinking, problem solving and group cooperation.

C. knowledge of and ability to apply environmental action strategies seeking to influence outcomes of environmental problems and issues

D. ability to develop and evaluate an appropriate action plan for the resolution of environmental problems or issues

Together, these four capabilities are what enable an individual to get involved in the behaviors outlined in section IV.

AFFECTIVE DIMENSIONS

A. recognition of the importance of environmental quality and the existence of environmental problems and issues

In addition to the aesthetic and ethical reasons for environmental maintenance, the reality of human dependence upon a healthy environment must be incorporated into that understanding.

B. empathic, appreciative and caring attitudes toward the environment

C. willingness to work toward the prevention and/or remediation of environmental problems and issues

ADDITIONAL DETERMINANTS OF ENVIRONMENTALLY RESPONSIBLE BEHAVIOR

A. Belief in their ability, both individually and collectively, to influence outcomes of environmental problems and issues

B. Assumption of responsibility for personal actions that influence the environment

These have been listed as "additional determinants" because the cognitive abilities and the desires which spring from affective dimensions are very strong contributors to an individual's actual actions.

PERSONAL AND/OR GROUP INVOLVEMENT IN ENVIRONMENTALLY RESPONSIBLE BEHAVIORS

Environmental action can be small personal changes in the way an individual chooses to live, on up to extensive/intensive group environmental action efforts. Since each "level" could be described as "equally desirable," the following categories were designed to describe different "types" of action, which would allow assessment of varying levels of involvement.

A. Ecomanagement - e.g. actions such as using a more energy efficient form of transportation, reducing consumption of energy or water, improving wildlife habitat, recycling, etc.

B. Economic/consumer action - e.g., purchasing products in returnable/reusable containers, avoiding purchase of excess packaging, avoiding items with toxic by-products, providing financial support to an environmental organization, boycotting products considered to be damaging to the environment, etc.

C. Persuasion - e.g., using informal discussion to encourage another to support a positive environmental position or action, distributing "pro-environment" literature, signing a petition, encouraging another individual or group to stop some kind of destructive behavior, writing a letter to a person/group/company to stop and action that has negative environmental consequences, giving a speech, etc.

D. Political action - e.g., writing letters or speaking directly to elected officials on behalf of an environmental issue, supporting by time or finances a candidate or lobbying group based upon an environmental issue, running for or serving in an official capacity with the intent of supporting pro-environmental positions or actions, etc.

E. Legal action - e.g. reporting violations in pollution/littering, fishing, trapping or hunting laws or plant or animal collecting to the authorities, working with authorities to patrol areas for enforcing environmental laws, providing information or testimony at a legal hearing or participating in a lawsuit against a person/group who has violated a law aimed at protecting the environment, etc.

H. Learning for a Sustainable Future, Developing a Cooperative Framework for Sustainable Development Education
Ottawa, Ontario Canada (1994)

EDUCATION FOR A SUSTAINABLE FUTURE: The Knowledge, Skills and Values Needed

Knowledge Needed:

1. The planet earth as a finite system and the elements that constitute the planetary environment.

2. The resources of the earth, particularly soil, water, minerals, etc., their distribution and their role in supporting living organisms.

3. The nature of ecosystems and biomes, their health and their interdependence within the biosphere.

4. The dependence of humans on the environmental resources for life and sustenance.

5. The sustainable relationship of native societies to the environment.

6. The implications of resource distribution in determining the nature of societies and the rate and character of economic development.

7. Characteristics of the development of human societies including nomadic, hunter-gatherer, agricultural, industrial and post-industrial, and the impact of each on the natural environment.

8. The role of science and technology in the development of societies and the impact of these technologies on the environment.

9. Philosophies and patterns of economic activity and their different impacts on the environment, societies and cultures.

10. The process of urbanization and the implications of de-ruralization.

11. The interconnectedness of present world political, economic, environmental and social issues.

12. Aspects of differing perspectives and philosophies concerning the ecological and human environments.

13. Cooperative international and national efforts to find solutions to common global issues, and to implement strategies for a more sustainable future.

14. The implications for the global community of the political, economic and socio-cultural changes needed for a more sustainable future.

15. Processes of planning, policy-making and action for sustainability by governments, businesses, non-governmental organizations and the general public.

Skills Needed:

1. Frame appropriate questions to guide relevant study and research.

2. Define such fundamental concepts as environment, community, development and technology, and apply definitions to local, national and global experience.

3. Use of range of resources and technologies in addressing questions.

4. Assess the nature of bias and evaluate different points of view.

5. Develop hypotheses based on balanced information, crucial analysis and careful synthesis, and test them against new information and personal experience and beliefs.

6. Communicate information and viewpoints effectively.

7. Work towards negotiated consensus and cooperative resolution of conflicts.

8. Develop cooperative strategies for appropriate action to change present relationships between ecological preservation and economic development.

Values Needed:

1. An appreciation of the resilience, fragility and beauty of nature and the interdependence and equal importance of all life forms.
2. An appreciation of the dependence of human life on the resources of a finite planet.
3. An appreciation of the role of human ingenuity and individual creativity in ensuring survival and the search for appropriate and sustainable progress.
4. An appreciation of the power of human beings to modify the environment.
5. A sense of self-worth and rootedness in one's own culture and community.
6. A respect for other cultures and a recognition of the interdependence of the human community.
7. A global perspective and loyalty to the world community.
8. A concern for disparities and injustices, a commitment to human rights, and to the peaceful resolution of conflict.
9. An appreciation of the challenges faced by the human community in defining the processes needed for sustainability and in implementing the changes needed.
10. A sense of balance in deciding among conflicting priorities.
11. Personal acceptance of a sustainable lifestyle and a commitment to participation in change.
12. A realistic appreciation of the urgency of challenges facing the global community and the complexities that demand long-term planning for building a sustainable future.
13. A sense of hope and a positive personal and social perspective on the future.
14. An appreciation of the importance and worth of individual responsibility and action.

III. CONCEPTUAL FRAMEWORKS FOR CURRICULUM MATERIALS

The form environmental education takes in practice is based heavily upon the curriculum materials that are available to those "out in the field" whether as teachers, naturalists, volunteer instructors or museum curators. The conceptual or curriculum frameworks direct the writing of individual lessons as well as the overall organization of the materials. Consequently, looking to how EE has been put into practice is an essential component of the development of a model or framework for EE standards. Although there is a plethora of curricula available, a small number of nationally recognized examples were selected for this initial review. In particular, the frameworks from Project WILD, Project Learning Tree, Essential Learnings, Earth Education, and Windows on the Wild, as well as curriculum frameworks developed for the States of Arizona, California, Minnesota, Missouri, New Jersey, Pennsylvania, and Wyoming are presented.

A. Project WILD
Western Regional Environmental Education Council
Boulder, CO. (1986)

CONCEPTUAL FRAMEWORK

I. Awareness and Appreciation of Wildlife

A. Humans and wildlife have similar basic needs
B. Humans and wildlife share environments.
C. Humans and wildlife are subject to many of the same environmental conditions.
D. Humans have far greater ability to alter or adjust to environments than does wildlife; thus, humans have a responsibility to consider effects of their activities on other life forms.

II. Human Values and Wildlife

A. Wildlife has aesthetic and spiritual values.
B. Wildlife has ecological and scientific values.
C. Wildlife has social and political values.
D. Wildlife has commercial and economic values.
E. Wildlife has consumptive and non-consumptive recreational values.

III. Wildlife and Ecological Systems

A. Each environment has characteristic life forms.
B. All living elements of an ecological system are interdependent.
C. Variation and change occur in all ecological systems.
D. Adaptation is continuous within all ecological systems.
E. Living things tend to reproduce in numbers greater than their habitat can support.

F. Each area of land or water, and ultimately the planet, has a carrying capacity of plants and animals.

IV. Wildlife Conservation

A. Management of resources and environments is the application of scientific knowledge and technical skills to protect, preserve, conserve, limit, enhance, or extend the value of a natural resource, as well as to improve environmental quality.

B. Wildlife is one of our basic natural resources, along with water, air, minerals, soil, and plant life.

C. Good habitat is the key to wildlife survival.

D. Wildlife resources can be managed and conserved.

E. Wildlife conservation practices depend on a knowledge of natural laws and the application of knowledge from many disciplines.

F. In the U.S., wildlife is considered to be a public resource. Ownership of land or water alone does not secure ownership of wildlife on that land or in that water as it does in some other countries.

V. Cultural and Social Interaction with Wildlife

A. Human cultures and societies, past and present, affect and are affected by wildlife and its habitat.

B. Societies develop programs and policies relating to wildlife and its habitat through a variety of social mechanisms.

VI. Wildlife Issues and Trends: Alternatives and Consequences

A. Human impacts on wildlife and its habitat are increasing worldwide.

B. Issues involving wildlife and its habitat are a product of social and cultural trends.

C. Current wildlife issues and trends are complex and involve alternatives and consequences.

D. Many problems, issues, and trends involving wildlife in other parts of the world are similar to those in this country.

VII. Wildlife, Ecological Systems, and Responsible Human Actions

A. Each person as an individual and as a member of society affects the environment.
B. Responsible environmental actions are the obligation of all levels of society, starting with the individual.

B. Pennsylvania Department of Environmental Resources and Pennsylvania Department of Education
Environmental Education Scope and Sequence K-12 (1988)

Knowledge of Natural and Human Resources:

K-3	4-6
Resources People Use	Natural Resources
Machines We Use	Machines and the Quality of Life
Resource Recovery	Resource Recovery

7-9	10-12
Renewable & Non-renewable	Human Impact on Natural Resources
Technology & a Balanced Environment	Technology & a Balanced Environment
Resource Recovery	Resource Recovery
Human Resources	Human Resources

Geographic Understanding: Local, Regional, and Global:

K-3	4-6
Adaptation of Plants and Animals	Adaptation of Plants and Animals
Habitat	Ecosystem
Pollution (local)	Pollution (local, regional and global)

7-9	10-12
Adaptation of Species	Human Adaptation and Diversity
Ecosystem	Humans in Ecosystem
Pollution (local, regional and global)	Pollution (local, regional and global)

Interrelationships and Interdependence of Natural and Human Systems:

K-3	4-6
Habitat	Ecosystem
Energy Flow	Energy Flow
Natural Cycles	Natural Cycles

7-9	10-12
Ecosystem	Human Impacts on the Ecosystem
Energy Flow	Energy Flow
Natural Cycles	Natural Cycles

Development of Personal Environmental Attitudes and Values:

K-3	4-6
Stewardship & Management	Stewardship & Management

7-9	10-12
Stewardship & Management	Stewardship & Management

Environmental Problem Solving and Management Skills:

k-3	4-6
Environmental Problem Solving	Environmental Problem Solving
Environmental Law/Political Action	Environmental Law/Political Action

7-9	10-12
Environmental Problem Solving	Environmental Problem Solving
Environmental Law/Political	Environmental Law/Political Action

Knowledge and Appropriate Uses of Energy:

K-3	4-6
Energy Conservation	Energy Conservation

7-9	10-12
Energy Conservation	Energy Conservation

C. Essential Learnings in Environmental Education
NAAEE/ SUNY Syracuse/ Center for Environmental Education, India (1990)

NATURAL SYSTEMS

General: Environment, Earth, Biosphere
Abiotic Components: Energy, Atmosphere, Land & Soil, Water
Biotic Components: Plant, Animal
Processes: Weather & Climate, Biogeochemical Cycles, Evolution and Extinction
Biological Systems: Ecosystems, Food Chains & Webs, Community, Population, Habitat & Niche

RESOURCES

Natural Resources: Distribution & Consumption, Management & Conservation, Sustainable Development
Abiotic Resources: Energy & Minerals, Water, Land & Soil
Biotic Resources: Forests, Wildlife & Fisheries, Biodiversity
Degradation of Resource Base: Limits to Systems, Pollution

HUMAN SYSTEMS

Humans and Environment: Humans as part of environment, human adaptation to environment, Human influence upon environment, population factors
Technological systems: Agriculture, Settlements, Manufacturing & Technology
Social Systems: Economic systems, Sociopolitical Systems, Culture & Religion
Environmental Awareness and Protection: Values & Ethics, Education & Communication, Participation/Voluntary Action, Legislation & Enforcement

D. Steve Van Matre
Earth Education
Institute for Earth Education, Greenville, WV (1990)

The Whys

Preserving

We believe the earth as we know it is endangered by its human passengers.

Nurturing

We believe people who have broader understandings and deeper feelings for the planet as a vessel of life are wiser and healthier and happier.

Training

We believe earth advocates are needed to serve as environmental teachers and models, and to champion the existence of earth's nonhuman passengers.

The Whats

Understanding

We believe in developing in people a basic comprehension of the major ecological systems and communities of the planet.

Feeling

We believe in instilling in people deep and abiding emotional attachments to the earth and its life.

Processing

We believe in helping people change the way they live on the earth.

The Ways

Structuring

We believe in building complete programs with adventuresome, magical learning experiences that focus on specific outcomes.

Immersing

We believe in including lots of rich, firsthand contact with the natural world.

Relating

We believe in providing individuals with time to be alone in natural settings where they can reflect upon all life.

E. Wyoming Environmental Education Task Force
Learner Outcomes for Environmental Literacy
State of Wyoming Department of Education (January 1992)

An environmentally literate person

-- has a working knowledge of those cross-disciplinary concepts pertaining to the sustainable use of an environment hospitable to the diversity of Earth's species, including man. (Goal I)

1. ... demonstrate a working knowledge of the basic resources of air, water and soil, their properties and the dynamics of their interaction with the rest of the living and non-living environment.

2. ... understand the dynamics of human population growth, inferring future population fluctuations and their likely impact upon the environment.

3. ... understand the relationship between beliefs, political structures, and environmental values of various cultures.

4. ... demonstrate knowledge of an environmental issue influenced by political, educational, economic and governmental institutions.

5. ... comprehend human dependence upon the utilization of natural resources for the satisfaction of such basic needs as food, shelter and clothing.

6. ... understand and value the roles undertaken by agriculture by business and industrial organizations, and by different levels of gov. in converting natural resources such as grass, minerals and trees to forms suitable for human use.

7. ... recognize that technological growth, which can have both positive and negative consequences, is exceeding our understanding of its impact upon the environment.

8. ... explain how conservation practices affect natural resources.

-- seeks to expand direct human experience with the natural world, to satisfy an insatiable curiosity about "how things work." (Goal II)

1. ... exhibit a preference for "hands-on" contact with his or her natural environment, for discovery, recreation and personal enrichment.

2. ... experience and describe the aesthetic value of nature.

3. ... understand that humans are a part of nature, not separate from it.

4. ... engage in the reading of current and historic literature written by important authors in natural history and conservation.

5. ... possess skills in conducting formal and informal research investigations in ecology and natural history.

6. ... demonstrate affective and cognitive skills in documenting personal experiences through the use of writing and sketching.

-- understands and values natural systems; comprehends that all life is connected, and that, before any part of an ecosystem is changed, the impact of the change on the ecosystem and the biosphere must be considered. (Goal III)

1. ... understand that the biosphere is a dynamic system.

2. ...demonstrate a working knowledge of what an ecosystem is and how it functions. More specifically, s/he will

    a. ... demonstrate an ability to trace the flow of energy through an ecosystem.

    b. ... demonstrate knowledge of the roles of producers, consumers, and decomposers in ecosystems.

    c. ... describe a food chain, including interdependency and its consequences.

    d. ... understand humans affect ecosystems and ecosystems affect humans.

3. ... define pollutants, and describe the effects of increased levels of pollution upon an ecosystem.

4. ... describe how manipulating habitat affects animal populations.

-- thinks critically about environmental issues, communicates effectively about them, and is motivated to help resolve them. (Goal IV)

1. ... have the capacity to make useful predictions, based upon available data.

2. ... work cooperatively in groups for the accomplishment of a goal.

3. ... Prioritize environmental problems, on the basis of their present and likely future impact.

4. ... predict and evaluate the consequences of alternative decisions producing environmental change.

5. ... understand that both action and inaction affect the outcome of environmental issues.

6. ... analyze how the economic values held by individuals, companies, and communities influence final decisions.

7. ... analyze the influence of mass media in shaping perceptions of the environment.

8. ... establish and defend a position on an environmental issue.

-- is committed to the continuing development and application of a sustainable land ethic. (Goal V)

1. ... describe generally accepted elements of a high quality environment.

2. ... compare, contrast, and evaluate responsible and irresponsible use of our natural resources.

3. ... comprehend the intent of an environmental law and the public policies derived from it.

4. ... identify and understand the role of resource agencies in enhancing the environment.

5. ... demonstrate stewardship practices that show respect for the earth and its living things.

6. ... justify treating public and private property with equal regard.

7. ... clarify personal feelings about an environmental dilemma, by the selection and defense of a position.

8. ... plan and implement an activity that enhances environmental quality.

9. ... assess personal commitment to protecting the environment, by evaluating himself or herself as a role model.

F. California Department of Education
California Energy Extension Service
Sonoma State University (January 1992)

CALIFORNIA DEPARTMENT OF EDUCATION
SCIENCE AND ENVIRONMENTAL EDUCATION UNIT

UNIFYING CONCEPTS OF ENVIRONMENTAL EDUCATION

Content / Process	THE NATURAL ENVIRONMENT Natural Systems and Interactions	THE BUILT ENVIRONMENT Human Alterations to Natural Systems	THE PERSONAL ENVIRONMENT Citizens' Roles, Responsibilities, Choices, and Actions
Fostering Awareness of and Respect for the Environment	Environmentally aware citizens cultivate in themselves and others a deep appreciation for natural systems and personal interactions with the natural environment. *California Curriculum Framework References:* *Science: Living Things, Ecosystems, Oceanography*	The individual members of sustainable human communities value the natural environment and recognize humankind's ultimate dependence upon renewable and nonrenewable resources. *History and Social Science : Geographic Literacy;* *Science: Geology and Natural Resources, Living Things, Ecosystems*	An individual's quality of life and attitude toward the environment depend upon the distribution and quality of natural resources, which may be regulated by laws and influenced by local interests, cultural values, political climate, and international relations. *History and Social Science : Sociopolitical Literacy, Cultural Literacy, Constitutional Heritage, National Identity*
Understanding Basic Environmental Concepts	The ultimate source of energy is the sun, and its energy is transformed and lost as it flows through ecosystems, of which human beings are a part. *Science: Living Things, Energy, Ecosystems, Matter*	Human Communities alter the natural and built environments through development and, as human populations increase, their impacts on the global environment become more pronounced. *History and Social Science : Historical Literacy, Geographic Literacy;* *Science: Geology and Natural Resources, Science, Technology and Society*	Every human affects the environment and can influence change through individual and collective action, civic responsiveness, consumer preference, and career choice. *History and Social Science : Civic Values, Rights and Responsibilities, Sociopolitical Literacy, Participation Skills*
Sustaining Responsible Actions Toward the Environment	To sustain the integrity of natural systems, humans must minimize their effects on the environment by thoughtfully restoring and preserving habitats' and species' diversity and protecting the quality of all natural resources. *History-Social Science : Historical Literacy, Ethical Literacy; Science: Ecosystems, Geology and Natural Resources*	The individual members of sustainable human communities learn from past experiences, acknowledge human limitations, anticipate changes, and develop innovative systems to conserve resources vital to both the natural and built environments. *History and Social Science : Ethical Literacy, Critical Thinking Skills, Historical Literacy, Economic Literacy; Science: Geology and Natural Resources, Science, Technology and Society*	Citizens of sustainable human societies manage natural and built systems responsibly and, with current understanding, capability, and foresight, regulate the careful use of natural resources by analyzing the benefits, costs, tradeoffs, and long-term effects of each alternative. *History and Social Science : Civic Values, Rights and Responsibilities, Economic Literacy, Critical Thinking Skills, Participation Skills;* *Science: Science, Technology and Society*

G. Comprehensive Plan for Environmental Education
Governor's Task Force on Environmental Education
State of Arizona (January 1992)

Arizona Environmental Education Goals

Pursuit of the following goals should accomplish the legislative intent of the Arizona Environmental Education Act: to develop an integrated environmental education program that achieves "awareness of students and the general public" that is "thorough, continuous and meaningful." Toward this end, the primary goals of environmental education in Arizona are:

- Each individual should have a basic understanding of the environmental sciences. Natural systems support all life, and it is critical that children and adults understand the basic ecological and other scientific principles by which these systems operate.

- Each individual should understand the interrelationships between human actions and the environment. Humans are a part of natural systems, and personal and societal choices have positive and negative effects on local and global environments.

- Environmental education should be integrated into all school curriculums.Environmental education belongs as an integral component or thematic bridge across all programs of study in public and private schools, from the preschool to postgraduate level.

- Diverse environmental education opportunities should be available to the general public. The general public, including Arizona residents and visitors, deserves expanded environmental learning opportunities that are stimulating as well as educational.

- Environmental education in Arizona should be a cooperative venture, coordinated at all levels within the state and with national and international networks. Increased communication and cooperation among the many public agencies and private organizations involved in environmental education contributes to more efficient use of available resources and more effective,balanced programs.

H. American Forest Foundation
Project Learning Tree
Environmental Education Activity Guide (1993)

Diversity

Diversity in Environments
Diversity of Resources & Technologies
Diversity Among and within Societies and Cultures

Interrelationships

- Environmental Interrelationships
- Resources & Technological Interrelationships
- Societal and Cultural Interrelationships

Systems

- Environmental Systems
- Resource Management & Technological systems
- Systems in Society and Culture

Structure & Scale

- Structures & Scale in Environments
- Structure & Scale in Resources & Technology
- Structure & Scale in Societies & Culture

Patterns of Change

- Patterns of Change in the Environment
- Patterns of Change in Resource and Technologies
- Patterns of Change in Society and Culture

I. New Jersey Environmental Education Commission
Environmental Education in New Jersey: A Plan of Action
Trenton, NJ: NJ Department of Environmental Protection & Energy (April 1993)

SKILLS AND BEHAVIORS THAT SHOULD BE DEVELOPED AMONG THE STATE'S CITIZENRY. The commission believes that all New Jerseyans should be able to:

Identify ecosystems and their interrelationships and interdependence.

Identify conservation practices and alternatives for energy resources.

Recognize the current and future value derived from the preservation of biological diversity.

Evaluate the long- and short-term economic costs and benefits of environmental quality.

Obtain and analyze relevant information, assess risks and make decisions on environmental issues.

Differentiate between supportive and destructive behaviors toward the environment.

Evaluate the impact of personal activities and social policies on the environment.

Take positive action to resolve and prevent environmental problems.

Develop a lifestyle that promotes environmental awareness and human health.

J. Minnesota EE Advisory Board
A Green Print for Minnesota: State Plan for Environmental Education
Office of Environmental Education, Minnesota Department of Education, St. Paul, MN, (June 1993)

State Goals for Environmental Education:

To understand ecological systems.

To understand the cause and effect relationship between human attitudes and behavior and the environment.

To be able to analyze, develop, and use problem-solving skills to understand the decision-making process of individuals, institutions, and nations regarding environmental issues.

To be able to evaluate alternative responses to environmental issues before deciding on alternative courses of action.

To understand the potential complementary nature of multiple uses of the environment.

To provide experiences to assist citizens to increase their sensitivity and stewardship for the environment.

To provide information citizens need to make informed decisions about actions to take on environmental issues.

K. State of New Jersey
New Jersey Environmental Education Standards & Curriculum Guidelines (Grades K to 12)
NJ Department of Environmental Protection & Energy Trenton, NJ (March 1994)

List of Environmental Education Standards: Grades K to 12

1. Students will develop environmental values through experiences which will enable them to investigate and become knowledgeable about local and distant environments.

2. Students will explore real-life settings which give rise to instances and understanding of habitat types.

3. Students will develop an understanding of humans and other living things through personal observations, readings, story telling and artistic expressions.

4. Students will explore the need and function of food and develop an understanding of the role that different foods play in a food web.

5. Students will understand the basic physiological differences between living creatures and understand the effect of these differences on how they gather, process and use their food.

6. Students will understand the effect of natural and manmade stresses on their bodies, lives, and the biodiversity of the species.

7. Students will understand how society can meet its needs without substantially infringing on the ability of future generations to sustain themselves.

8. Students will be able to clarify issues, develop and test hypothesis, construct generalizations, draw conclusions, offer solutions to problems, predict possible outcomes and predict future uses and problems related to the environment and the creatures that populate it.

L. Governor's Task Force on Environmental Education (Missouri)
Creating an Environmentally Literate Citizenry
State of Missouri (July 1994)

An environmentally-literate citizen is

- Knowledgeable of the challenges we face in protecting our natural resources.
- An effective member or society.
- Able to demonstrate civic and economic competence.

The characteristics of an environmentally literate citizenry include

A basic understanding of

- The natural environment (ecology).
- The dynamics of the built (human-made) environment.
- The cause-and-effect relationship between human behavior and the environment, and of the economics of that relationship.
- Environmental issues.

- The decision-making processes of governments, businesses, and other social, political, and economic institutions impinging upon environmental issues.

Development of

- The personal skills necessary for problem-solving, risk analysis and integrating diverse perspectives in order to understand and contribute to decision-making processes.
- The commitment to act for a healthy environment based on one's attitudes, knowledge and skills.

Curriculum Objectives:

A. Appreciation and Awareness
Provide citizens with an awareness and appreciation of natural resources through personal experiences and skill development.

To accomplish this end, teachers should:

1. Promote environmental awareness and appreciation through direct and indirect experiences with local, state, national and international natural resources.
2. Instill knowledge about humans and the environment through individual and collective experiences to create awareness of the relationship between human survival and interactions with the environment.
3. Enhance physical fitness by creating opportunities to develop outdoor recreation skills.
4. Create opportunities to develop a respect for the biosphere. This respect will encourage people to maintain a healthy environment, providing benefits for themselves and others.

B. Ecological Foundations
Equip citizens with sufficient knowledge to permit them to make sound decisions with respect to environmental issues. To accomplish this end, teachers should provide learning opportunities through a variety of experiences that accomplish the following:

   1. Exemplify biochemical cycling (the natural processes that recycle nutrients in various chemical forms from the environment, to organisms, and then back to the environment.)

2. Allow individuals to understand the complexity of ecosystems.

3. Allow individuals to understand the need for biodiversity in the biosphere.

4. Allow individuals to understand the reality that human and natural forces continually shape and alter various conditions.

5. Allow individuals to understand how natural resources are defined by their usefulness to society and are the basis of the economy.

C. Analysis of Issues

Provide citizens with the opportunity to develop a general awareness of how individual and collective actions may influence the relationship between quality of life and quality of the environment.

To accomplish this end teachers should use secondary resources to:

1. Assess how human cultural activities, past, present and future, influence the environment from an ecological perspective.

2. Assess alternative actions and perspectives for specific issues with respect to their cultural, historical, social, economic, political and ecological implications.

D. Investigation and Evaluation

Provide citizens with the knowledge and skills necessary to permit them to investigate environmental issues and evaluate alternative actions. This stage should provide educational opportunities for students and citizens to participate in implementing the identified skills.

To accomplish this end teachers should provide opportunities for citizens to:

1. Analyze and assess natural and manmade events as they become issues.

2. Develop and administer surveys and conduct research on local, state, national and global environmental issues.

3. Analyze and assess data collected from surveys and research.

4. Assess and analyze data necessary to achieve the goal of establishing and maintaining a dynamic equilibrium between quality of life and quality of the environment.

5. Identify and analyze alternative actions with respect to political, social, economic, cultural, historical and ecological implications.

E. Environmental Action Skills
Provide citizens with the skills necessary to implement responsible environmental actions to maintain a dynamic equilibrium between quality of life and quality of the environment.

To accomplish this, teachers should provide citizens with the following:

1. Skills necessary for planning responsible actions for ecosystem management.

2. The opportunity to develop a plan of action in response to their issue investigation.

3. The opportunity to use skills of assessment and analysis to evaluate proposed action plans.

M. Braus, Judy
Windows on the Wild - Appendix 5: Framework
Draft Biodiversity Education Framework
Washington, DC: World Wildlife Fund (1994)

Key Concepts

Definition: Biological diversity, or "biodiversity," encompasses the variety of all life on Earth - from microscopic plants to blue whales. It also includes the variety of ecosystems and ecological processes that sustain this life.

- Biodiversity is commonly analyzed at these three levels:

  -- Ecosystem diversity refers to the variety of habitats, biological communities, and ecosystems where organisms live and evolve. It also refers to the variety of ecological processes within ecosystems.

  -- Species diversity describes the numbers and variety of organisms that live on Earth.

  --- Genetic diversity refers to the sum total of genetic information contained in the genes of organisms. This can be examined at the level of individuals, populations, or species.

Factors Affecting Biodiversity

- Natural systems are dynamic and disturbances help maintain ecosystem health. Small scale disturbances, such as a tree falling in a forest, can actually maintain or increase biodiversity.

- Biodiversity is the key to the resilience of nature after intense changes in environmental conditions such as floods, earthquakes, hurricanes, and volcanic eruptions.

- Human-induced changes in the environment, such as pollution, habitat degradation, and the introduction of exotic species, push the limits of nature's resilience and may lead to irreversible environmental damage and biodiversity loss on human time scales.

- Biodiversity is reduced by changes in the environment that exceed the ability of populations of plants, animals, and other living things to adapt. This inability to adapt to changing environmental conditions leads to the extinction of species - either locally or globally.

- Human populations are growing at an exponential rate and, as they grow, they expand and alter the natural environment at ever faster rates that can lead to accelerated, permanent loss of biodiversity.

- The loss and degradation of entire ecosystems, such as forests, wetlands, and coastal waters, is the single most important factor behind the current extinction of species. This large-scale degradation is the result of human population growth, pollution, and non-sustainable consumption patterns.

The Value of Biodiversity

- Biodiversity helps support life on Earth in many ways. For example, genetic diversity within species allows species to adapt to changes in the environment over time; species diversity provides a variety of interactions that contribute to energy flow and nutrient cycling in ecosystems; and ecosystem diversity provides a suite of ecological "services" that maintain the biosphere, including water and air purification, micro-climate control, and soil stability.

- Human welfare depends on biological diversity for economic benefits such as sustaining and improving agriculture and providing opportunities for medical discoveries and industrial innovations.

- People value biodiversity for aesthetic, moral, spiritual, educational, economic, recreational, and other reasons.

- Culture is closely linked to biodiversity. Our cultures are shaped, in part, by the environment. And our collective knowledge of biodiversity, including its use and management, is linked to the many ways different cultures interact with the environment. Efforts to conserve biodiversity must be developed within the constructs of local cultures. Conversely, conserving biodiversity often helps strengthen cultural integrity and values.

Biodiversity Issues

- There are many interrelated political, economic, and social issues that develop as a result of human impact on biodiversity.
- Environmental problems associated with biodiversity loss don't always adversely affect all people in a region equally - they often disproportionately affect only certain populations, such as low-income communities.
- Biodiversity issues are associated with conflicts in values and beliefs.
- Individuals play an important role in resolving biodiversity problems and issues.
- Scientific and technological means exist to manage and protect biodiversity; however, science and technology may not always be adequate to resolve biodiversity problems and issues.
- Sociopolitical (educational/legal/economic/political/ cultural) processes and institutions can be used to resolve biodiversity issues.

Actions and Skills

Students should be able to:

- identify changes in biodiversity at their local level.
- investigate and analyze patterns and structural foundations of biodiversity issues.
- synthesize and evaluate gathered information, including biographies of heroes and success stories, to identify models and alternate solutions.
- clarify and analyze their own values and priorities relating to biodiversity issues.
- identify alternative values or priorities held by others on biodiversity issues.
- participate effectively in group problem solving activities.

- effectively communicate ideas and information about biodiversity issues.

- effectively implement selected actions regarding local and global biodiversity problems and solutions.

- know how to work cooperatively with others to establish objectives and develop new habits of thinking, valuing, and acting.

Sample Experiences

To learn the concepts and skills in this framework students will be involved in a variety of learning experiences, including:

- community investigations using cameras and other tools.

- visits to nonformal institutions to take part in hands-on explorations and discoveries related to wildlife and wildlands.

- interviews and interactions with culturally diverse students, community leaders, and parents.

- plant and animal "adoption" and "neighborhood restoration" programs .

- research using primary and secondary resources.

- mentoring programs that encourage partnerships between students and community members and younger and older students.

- simulation games to accelerate learning of complex relationships among biodiversity concepts and issues.

IV. PREVIOUS STANDARDS OR CRITERIA DEVELOPMENT PROJECTS

The quest for defining what constitutes quality environmental education is not new. The following represent efforts by the National Science Teachers Association and the American Society for Testing and Materials (ASTM) to develop guiding principles for environmental education. Also included is material prepared by the American Forum for Global Education suggesting conceptual guidelines for the development of national standards for international studies education.

A. National Science Teachers Association
Criteria for Excellence in Environmental Education
Criteria for Excellence, Revised Edition

Effective environmental education depends on multidisciplinary instruction but has a strong science component. It involves minds-on direct contact with environments as well as vicarious experiences. The learner grows from awareness and understanding to concern and action.

Goal

To develop and practice creativity and critical thinking along with values analyses. Teachers and learners will search for alternative solutions to environmental issues and evaluate the ethical, social, ecological, and economic costs and benefits of alternatives.

Curriculum

1. Provides activities and information in which people interact with the environment.
2. Develops in the students the intellectual tools to effectively explore the world around them;
3. Directly involves students in investigating the world around them and their relationship to it.

Instruction

1. Fosters open minds and the generation and examination of alternatives;
2. Stimulates and fosters creativity and critical thinking;
3. Respects the social, intellectual, and developmental maturity of learners;
4. Links science with other areas of intellectual and emotional activity;
5. Provides opportunities for students to be involved in environmental activity at an appropriate level of challenge; hence, fosters a growing sense of confidence that groups and individuals can positively affect the environment;
6. Relates the components of the ecosystem to our health, well-being, and potential for development.

Evaluation

Effective programs and materials provide

1. Evaluation design based on stated goals, objectives, and outcomes;
2. Field testing of programs and materials in terms of stated goals and objectives;
3. Continuous modification and feedback.

Teachers

1. Distribute EE guidelines to colleagues;
2. Encourage colleagues to increase their environmental literacy;
3. Hold clearly stated goals and objectives for learner behavior;
4. Treat controversial issues fairly and honestly;
5. Teach people how to think, not what to think.

B. ASTM
Formal Education Committee, Teacher Education Task Group (April 1991)

Environmental Education Teacher Education Standards (Draft)

Ecological Foundations: The environmental educator should be able to...

1....communicate and apply major ecological concepts (e.g. individuals and species, populations, communities and ecosystems; biogeochemical cycles; energy production, storage, transfer and degradation; interdependence; niche; adaptation; succession; homeostasis; and human as an ecological variable).

2...communicate the usefulness of ecological concepts in understanding human dependence on a stable, productive ecosystem for survival.

3...identify important ecological principles involved in environmental problems and issues.

4...predict the probable ecological consequences of alternative solutions to environmental problems and issues.

5...identify, select and utilize appropriate sources of scientific information in a continuing effort to investigate, evaluate and develop solutions for environmental problems and issues.

Conceptual Awareness

6...describe how human cultural activities (e.g., religious, economic, political, social, and others) influence the environment from a ecological perspective.

7...describe how people's behaviors, individually and collectively, impact upon the environment from an ecological perspective.

8...identify a wide variety of environmental issues and describe the ecological and cultural implications of those issues.

9...identify various alternative solutions available for particular environmental issues and describe the ecological and cultural implications of those solutions.

10..describe the roles played by differing beliefs and values in environmental issues.

Issue Investigation and Evaluation

11..investigate environmental issues using both primary and secondary sources of information (e.g., generate research questions; develop a survey; plan a data collection strategy; organize data into charts/tables/graphs; generate data-based conclusions, inferences and recommendations; communicate research findings).

12..analyze environmental issues, their associated values and beliefs, and their ecological and cultural implications.

13..evaluate alternative solutions with respect to their ecological and cultural implications.

14..identify, evaluate, and modify (where appropriate) personal value positions with respect to environmental issues and solutions.

Environmental Action

15..develop a plan for personal involvement in attempting to remediate environmental issues, using the following strategies: persuasion, consumer action, political action, legal action, and eco-management (physical action).

16..evaluate specific action strategies with respect to personal, ecological, and cultural implications.

Instructional Applications

17..apply a knowledge of educational philosophy to the selection, development, and implementation of curricular programs and strategies to achieve both general education and environmental education goals.

18..utilize current theories of moral reasoning and valuing processes in selecting, developing, and implementing curricula which will effectively achieve accepted goals of environmental education with a variety of learners.

19..utilize current theories of knowledge/attitude/behavior relationships in selecting, developing, and implementing a balanced curriculum which maximizes the probability of desired behavior changes in learners.

20..utilize current theories of learning (e.g., Piaget, Bruner, Gagne) in selecting, developing, and implementing curricular materials and teaching strategies to effectively achieve environmental education goals with a variety of learners.

21..apply the theory of transfer of learning in selecting, developing and implementing curricular materials and strategies to insure that learned knowledge, attitudes and cognitive skills will be transferred to life style decision-making by learners.

22..develop and use effective means of planning and managing instruction (e.g., designing instructional units; managing small and large instructional groups, dealing with controversial issues, etc.)

23..select and implement effective instructional methodologies which are appropriate for desired cognitive, affective, and behavioral outcomes and a variety of learner characteristics (e.g., outdoor education methods, affective education methods, simulation games and role playing, case studies methods, community resource use, etc.)

24..infuse environmental education curricula and methods into other disciplines when appropriate.

25..evaluate environmental education curricula and methods with respect to learner achievement in cognitive, affective, and behavioral dimensions.

26..foster environmental sensitivity in learners, utilizing current research in that area.

C. **ASTM**
EE Curriculum Draft Standards
Curriculum Task Group T04.02.02 (September 1991)

These guidelines recommend that formal educational institutions and agencies develop, promote, and facilitate environmental education curricula that enhance environmental awareness and knowledge; as such the guidelines will:

Impart overall environmental awareness and knowledge.

Recognize and emphasize ecology as a critical cornerstone of all environmental education programs.

Communicate and apply major ecological concepts to an improved awareness and understanding of the environment (e.g...., humans as ecological variables, and extensive discussions and illustrations of different scales of time and space as they relate to function and development of any ecosystem).

Communicate and apply major social science concepts to an improved awareness and understanding of the environment.

Demonstrate the usefulness of ecological and social science concepts in understanding human dependance upon stable and productive ecological and social systems for survival.

These guidelines recommend that formal educational institutions and agencies develop, promote, and facilitate environmental curricula that demonstrate issue investigation, analysis, and action skills; as such, the guidelines will:

Identify a wide variety of environmental issues and problems and demonstrate the application of ecological and social science concepts in recognizing and interpreting these issues and problems.

Describe how human behavior, beliefs, values and cultural activities (e.g. religious, economic, political, social, and others) impact on the environment and relate to environmental issues and problems.

Recommend various issues investigation strategies using both primary and secondary sources of information (e.g. generating research questions; developing a survey; planning data-collection; organizing data into charts/tables/graphs; generating data-based conclusions; developing inferences and recommendations; and communicating research findings).

Identify various alternative solutions to environmental problems and predict the possible or probably ecological, social, political, legal, and economic consequences of alternative solutions to these problems.

Demonstrate a strategy for the identification, evaluation, and modification of personal and group value positions and action strategies, relative to the environment.

Demonstrate strategies for the correction of environmental problems (e.g. persuasion, consumer action, political action, legal action, and eco-management).

Identify sources of scientific and social science information appropriate to the investigation and evaluation of environmental issues, problems, and solutions.

These guidelines recommend that formal educational institutions and agencies develop, promote, and facilitate environmental education curricula that demonstrate the following instructional methodologies:

GOAL ORIENTATION

A knowledge of education philosophy will be used to select, develop, and implement curricular programs and strategies to achieve both general educational and environmental education goals.

COORDINATION WITH ESTABLISHED LEVELS OF ENVIRONMENTAL LITERACY

Graded environmental education curricula will be developed to coordinate with the various levels of environmental literacy as detailed in Literacy Standards for Environmental Education (refer to documents produced by the Environmental Literacy Subcommittee: T04.01: e.g., curricula for the nominally, functionally, and operationally literate.)

COORDINATION WITH CONVENTIONAL LEVELS OF INSTRUCTION

Environmental education curricula will be developed which are targeted toward several primary levels of instruction: teacher education, lower/upper elementary education, and secondary education. The curricula will be designed so that its facilitation and mode of presentation will be appropriate to the learning level toward which it is targeted.

CURRICULUM INFUSION

Environmental education curricula will be designed with open-ended components to allow for (a) ease of infusion into existing curricula, (b) opportunities for educators to create their own unique topic approaches and presentation formats, and (c) on-going modifications to reflect the dynamic, ever changing nature of environmental instruction.

COMPATIBILITY WITH ACCEPTED THEORIES OF TEACHING AND LEARNING

Environmental education curricula will be developed that utilize and reflect a wide diversity of instructional applications, as detailed in Teacher Education Standards for Environmental Education (e.g. contemporary theories and practices relating to education philosophy, learning behavior, teaching methodologies, evaluation, and development of curriculum materials).

SELECTION OF APPROPRIATE METHODOLOGIES/SITES

Environmental education curriculum will select and implement instructional methodologies and sites which are appropriate for desired cognitive, affective, and behavioral outcomes and for a variety of learner characteristics (e.g. outdoor education methods, affective education methods, simulation games and role playing, case study methods, community resource use, etc.)

EVALUATION

Environmental education curricula should be designed for ease of evaluation. The evaluation criteria should reflect elements typical of any conventional curriculum as well as evaluation components that may be unique to the scope of environmental education.

D. **Smith, Andrew**
The American Forum for Global Education
Concept Paper on Developing National Standards for International Studies Education New York (April 1994)

Global Issues and Topics

A. global environment, including biodiversity and species protection
B. global resources, the need for conservation, development of alternative energy sources, and sustainability
C. global trends in population and related issues such as urbanization, migration, growth and control, and population distribution
D. major economic realities and significant issues of international trade, development, aid and investment
E. world peace and security
F. international human rights and human values
G. hunger, food supply and distribution around the world
H. ethnic conflict, diversity and human commonality
I. significant differences in systems of government
J. the United Nations and other international and regional organizations
K. world cultures
L. global developments in science and technology

Culture Studies and Area Studies

America and the World

A. America's contemporary and historical connections with global issues and areas
B. understanding individuals' relationships and connections with global issues and other cultures
C. citizenship responsibilities

V. SYNTHESIS: TOWARD A FRAMEWORK FOR STANDARDS

The Tbilisi Declaration proposed five categories of objectives for environmental education: awareness, knowledge, attitudes, skills and participation. Although the language has changed over time and categories have been combined and split apart, there is a great deal of overlap between the Tbilisi objectives and the various goals presented in the literature. Hungerford et al (1980) explicitly validated their four goal levels against the Tbilisi objectives. Of particular interest is that the four goals provide greater detail, distinguishing among different types of knowledge (e.g., knowledge of ecological principles, knowledge concerning environmental issues).

Building off of this work, Iozzi et al (1990) not only include awareness and attitude components (affect), knowledge (cognitive domain), and participation (responsible environmental behavior), but propose two additional components: locus of control and assumption of personal responsibility. Similarly, Roth (1993) divides his framework into four strands: knowledge, affect, skill and behavior. Although included under the affect strand, Roth also recognizes the importance of both locus of control and the assumption of personal responsibility in his model.

The work presented by the Wisconsin Center for EE continues in a similar vane, proposing four major outcomes: cognitive, affective, determinants of environmentally responsible behavior (which includes locus of control and assumption of personal responsibility), and environmentally responsible behaviors. In this case, the cognitive domain is subdivided into knowledge of ecological principles, knowledge of environmental problems and issues, and knowledge of environmental issue investigation and action strategies. This last component of knowledge is included under a skills category in some of the other models.

Finally, the work of the EE Literacy Consortium synthesized much of this literature, forming four categories: cognitive dimensions (knowledge and skills), affective dimensions, additional determinants of environmentally responsible behavior, and personal and/or group involvement in environmentally responsible behaviors. Of particular interest is the recognition of the importance of socio-political knowledge (along with ecological knowledge) as a foundation. Although the socio-political domain is imbedded in several of the frameworks, the Environmental Education Literacy Consortium has elevated it to an equal status of ecological knowledge.

Consequently, it seems that an initial, draft framework can be constructed that encompasses the major components of each of the above models, while also being informed by the various EE curriculum products. This framework would include: affect, ecological knowledge, socio-political knowledge, knowledge of environmental issues, skills, additional determinants of environmentally responsible behavior, and environmentally responsible behaviors. As can be seen in the following table, the proposed framework provides considerable overlap with the models suggested in the literature. Additionally, there is substantial congruence between the framework and the various curricula and previous standards/criteria development projects.

Comparison of Draft Framework and EE Literature

	Affect	Ecological Knowledge	Socio-Political Knowledge	Knowledge of Env. Issues	Skills	Determinants of Env Responsible Behavior	Behavior
Tbilisi	x	x	x	x	x	x	x
Stapp & Cox	x	x	x	x	x		x
Hungerford, et al.	x	x	x	x	x		x
Iozzi, et al	x	x		x	x	x	x
Marcinkowski	x	x	x	x	x	x	x
Wisconsin Ctr	x	x		x	x	x	x
Roth	x	x	x	x	x	x	x
EE Literacy Consortium	x	x	x	x	x	x	x
Sustainable Development	x	x	x	x	x	x	x
Project Wild	x	x	x	x		x	x
Pennsylvania	x	x	x	x	x	x	x
Essential Learnings	x	x	x				x
Earth Education	x	x			x		x
Wyoming	x	x	x	x	x	x	x
California	x	x	x	x	x	x	
Arizona		x					
NJ EE Commission		x	x	x	x	x	x
Minnesota EE	x	x	x	x	x		x
New Jersey	x	x	x		x	x	
PLT	x	x	x	x	x		
Missouri	x	x	x	x	x		x
Braus - WWF	x	x	x	x	x	x	x
NSTA	x	x		x	x		x
ASTM - Teacher	x	x	x	x	x		
ASTM - Curriculum	x	x	x	x	x		
Smith - AFGE	x	x	x	x	x		x

Utilizing examples from the literature to flesh out the framework may provide greater imagery:

A. Affect

Environmental sensitivity or appreciation;

Attitudes: toward pollution, technology, economics, conservation, and environmental action;

Willingness to recognize and choose among differing value perspectives associated with problems and issues;

Motivation to actively participate in environmental improvement and protection;

Moral Reasoning: making decisions and judgments about environmental issues according to one's own sense of morality;

Values clarification.

B. Ecological Knowledge

Communicate and apply the major ecological concepts including those focusing on individuals, species, populations, communities, ecosystems, biogeochemical cycles,

energy production and transfer, interdependence, niche, adaption, succession, homeostasis, and humans as a ecological variable;

A knowledge and understanding of how natural systems work, as well as of how social systems interface with natural systems;

Change and limiting factors (change as a natural process; biotic and abiotic limits to growth, size, and distribution of population).

C. Socio-political Knowledge

Clear awareness of economic, social, political and ecological interdependence in urban and rural areas;

Understand and communicate how human cultural activities (e.g., religious, economic, political, social and others) influence the environment from an ecological perspective;

Understand the relationship between beliefs, political structures, and environmental values of various cultures;

Understand the basic components of societal systems;

Geographic understanding at the local, regional, and global levels;

Understand patterns of change in society and culture;

Understand structure and scale in societies and culture.

D. Knowledge of Environmental Issues

An understanding of the various environmentally-related problems and issues (local, regional, national, international, and global);

Demonstrate knowledge of an environmental issue influenced by political, educational, economic and governmental institutions;

Air Quality (ozone depletion; global warming; acid deposition; air pollution);

Water Quality and Quantity (water pollution; use and management);

Soil Quality and Quantity (soil depletion and pollution; use and management);

Wildlife and Habitat;

Energy;

Land Use;

Human Population and Health;

Waste.

E. Skills

Identifying and defining problems;

The skills required to analyze, synthesize, and evaluate information about environmental problems/issues using primary and secondary sources, and to evaluate a select problem/issue on the basis of evidence and personal values;

Skills for dealing with action strategies: including selecting appropriate action strategies, creating an action plan, evaluating an action plan, and implementing an action plan;

Conducting basic risk analysis;

Thinking in terms of systems;

Using ability to forecast, to think ahead, plan.

F. Additional Determinants of Environmentally Responsible Behavior

Locus of control;

Assumption of personal responsibility (includes recognition that one's negative behavior has a negative effect on the environment and, likewise one's positive behavior can have potentially positive effects on the environment; acceptance of personal responsibility for negative environmental effects or impacts; willingness to help correct negative environmental impacts and resolve environmental impacts and issues).

G. Environmentally Responsible Behaviors

Active participation aimed at solving problems and resolving issues;

Environmentally sound consumer purchasing (consumerism);

Methods for conserving resources (ecomanagement);

Assisting with the enforcement of environmental regulations (legal action);

Using personal and interpersonal means to encourage environmentally sound practices (persuasion);

Encouraging environmentally sound policies and legislative initiatives (political action).

Working Paper #3

Developing a Framework for Environmental Educator Performance Standards

Preface

This paper presents an examination of existing guidelines or competencies for environmental educators as well as a synthesis of these guidelines that will help direct the development of environmental educator performance standards. The purpose is to provide an overview of the relevant literature, and to spur deliberation.

I. DEVELOPING A FRAMEWORK FOR ENVIRONMENTAL EDUCATOR PERFORMANCE STANDARDS

Quite obviously, the development of environmental educator performance standards are related integrally to student performance standards. Defining what children should know and be able to do determines, to some degree, what educators then need to know and be able to do. But being an effective environmental educator requires more than competency with a specific set of learner knowledge and skills. Educators design programs and curricula, teach students with diverse backgrounds, maintain educational policies, assess student achievement, and utilize a variety of educational strategies.

To facilitate discussion of what environmental educators should know and be able to do, proposed guidelines will be divided into those based on: research or a synthesis of the research literature; state guidelines/requirements for environmental education certification or endorsement; and standards or criteria developed by previous projects.

II. GUIDELINES BASED ON EE LITERATURE

Although there is a substantial literature within environmental education concerning its definition and substance (see working paper #2 for examples), there is relatively little that relates directly to the question of what environmental educators should know and be able to do. Interestingly, the vast majority of this literature was developed within the international arena for Unesco-UNEP.

A. **Stapp, William B.**
Preservice Teacher Education
What Makes Education Environmental? (McInnis, Noel & Albrecht, Don (eds.))
Louisville, KY: Data Courier Inc. (1975)

Suggested environmental educator competencies:

1. Environmental science competencies comprising (i) Ecological foundations, (ii) Economic foundations, and (iii) Human ecosystem foundations.

2. Educational competencies comprising (i) Psychological foundations, and (ii) Educational foundations

3. Environmental education skills comprising (i) Problem-solving, (ii) Handling of values and controversial issues, and (iii) Use of materials and local situations pertaining to the environment.

4. Methods of teaching environmental education comprising (i) Aims and objectives, (ii) EE methods and techniques, (iii) Resources for learning and group dynamics, (iv) Curriculum design, and (v) Field work and environmental ethics.

B. Peyton, B.; Hungerford, H., and Wilke, R.
Epilogue: A Diagnosis and Prescription in Case Studies of Teacher Education Programs for Environmental Education, Bowman, M. and Disinger, J. (eds.)
Columbus, OH: ERIC/SMEAC (1980)

The effective environmental education teacher should be able to...

1.·... apply a knowledge of educational philosophy to the selection (and/or development) of curricular programs and strategies to achieve both general education and environmental education goals. It is important that all educators be aware of the philosophical basis for education in their own society. Environmental education goals and methods should be evaluated in light of such philosophies as Experimentalism or Reconstructionism. Many accepted goals of general education supported by such philosophies are entirely consistent with environmental education goals. General education materials and methods may sometimes need to be "environmentalized" to achieve the goals of each.

2. ... utilize current theories of moral reasoning in selecting, developing and/or implementing environmental education curricula in order to effectively achieve accepted goals of environmental education with selected receiver groups. Included in this category of "moral reasoning" are not only theories of moral development, but theories of valuing processes as well. Environmental education teachers should be competent to assess the developmental readiness of receivers when dealing with attitudes and processes in the affective domain. Teachers should be able to use strategies which allow receivers to recognize the role of values in environmental decision making, clarify value positions, and understand the valuing process.

3. ...utilize current theories of knowledge/attitude/behavior relationships in selecting, developing and/or implementing a balanced curriculum which maximizes the probability of desired behavior changes in receivers. Environmental educators often assume linear relationships among ecological knowledge, positive environmental attitudes, and environmentally ethical behavior. Current research indicates that such may not be the case. Many variables impinge on environmentally ethical behaviors, including various categories of knowledge (e.e., ecological knowledge vs trade-off costs), experiences, and locus of control (internal or external). A balanced and syntactically sound curriculum is necessary to achieve environmental education goals.

4. ... utilize accepted learning theory (e.g., Piaget, Bruner, Gagne) in selecting, developing, and/or implementing curricular materials and teaching strategies to effectively achieve environmental education goals with selected receiver groups. The nature of many environmental education goals is problem solving. Learning theory has much to offer in guiding the selection of materials and strategies to develop problem solving abilities. Selection of appropriate environmental education materials and strategies for specific receiver age levels may be effective when theories of learning development are considered. A pragmatic approach to this body of knowledge would do much to increase the effectiveness of environmental education teachers.

5. ... teach for the transfer of learning to insure that learned knowledge, attitudes, and cognitive skills will be transferred to lifestyle decision-making by receivers. The ultimate goal of environmental education is to produce environmentally literate citizens who are willing and capable of taking positive environmental action in their lives. To often, educators fail to teach for the transfer of knowledge, attitudes, and cognitive processes learned in the classroom, to use in problem solving in students' lives.

6. ... select and implement effective instructional methodologies to achieve environmental education goals appropriate for desired cognitive and affective outcomes, receiver characteristics, and available facilities (e.g., time, money, personnel:

  a. outdoor education methods.

  b. affective education methods (e.g. values clarification, Bank's inquiry model, moral dilemma model).

  c. simulation games (including role playing).

  d. case study methods

  e. community resource use (ecological, issue-related, human resources).

  f. methods of autonomous student and/or group investigation and evaluation of environmental issues.

  g. methods for effectively handling controversial environmental issues.

9 ... use effective means of planning for instruction.

10... effectively infuse environmental education curricula and methods into all appropriate disciplines.

11... effectively evaluate environmental education instructional outcomes in cognitive, affective, and behavioral domains.

C. Wilke, R.; Peyton, R.B.; and Hungerford, H.
Strategies for the Training of Teachers in Environmental Education
Paris: Unesco-UNEP (1987)

{In addition to the competencies outlined above in Peyton, Hungerford and Wilke (1980), the following content competencies were recommended.}

Competencies in Environmental Education Content

Level I: Ecological Foundations

The effective E.E. teacher should be able to...

(11) ... apply a knowledge of ecological foundations to the analysis of environmental issues and identify key ecological principles involved.

(12) ... apply a knowledge of ecological foundations to predict the ecological consequences of alternative solutions to environmental problems.

(13) ... be sufficiently literate in ecology to identify, select, and interpret appropriate sources of scientific information in a continuing effort to investigate, evaluate and find solutions for environmental problems.

(14) ... communicate and apply in an educational context, the major concepts in ecology.

Level II: Conceptual Awareness

The effective E.E. teacher should be able to select, develop and/or implement curricular materials which will affectively make receivers aware of ...

(15) ... how man's cultural activities (e.g., religious, economic, political, social, etc.) influence the environment from an ecological perspective.

(16) ... how individual behaviors impact on the environment from an ecological perspective.

(17) ... a wide variety of local, regional, national and international environmental issues and the ecological and cultural implications of these issues.

(18) ... the viable alternative solutions available for remediating discrete environmental issues and the ecological and cultural implications of these alternative solutions.

(19) ... the need for environmental issue investigation and evaluation as a prerequisite to sound decision making.

(20) ... the roles played by differing human values in environmental issues and the need for personal values clarification as an integral part of environmental decision making.

(21) ... the need for responsible citizenship action (e.g., persuasion, consumerism, legal action, political action, ecomanagement) in the remediation of environmental issues.

Level III: Investigation and Evaluation

The effective E.E. teacher should be competent to investigate environmental issues and evaluate alternative solutions and to develop, select and/or implement curricular materials and strategies which will develop similar competencies in receivers, including ...

(22) ... the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information and to synthesize the data gathered).

(23) ... the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

(24) ... the ability to identify alternative solutions for discrete issues and the value perspectives associated with these solutions.

(25) ... the ability to autonomously evaluate alternative solutions and associated value perspectives for discrete environmental issues with respect to their cultural and ecological implications.

(26) ... the ability to identify and clarify their own value positions related to discrete environmental issues and their associated solutions.

(27) ... the ability to evaluate, clarify, and change their own value positions in light of new information.

Level IV: Environmental Action Skills

The effective E.E. teacher should be competent to take positive environmental action for the purpose of achieving and/or maintaining a dynamic equilibrium between quality of life and the quality of environment, and to develop, select, and/or implement curricular materials and strategies to develop similar competencies in receivers to take individual or group action when appropriate (i.e., persuasion, consumerism, political action, legal action, ecomanagement, or combinations of these action categories).

D. Hungerford, H. and Peyton, R.B.
Procedures for Developing an Environmental Education Curriculum
Paris: Unesco-UNEP (1986)

Teacher preparation in EE should ...

1. ... focus on and reflect the many-faceted and interdisciplinary nature of EE. In so doing, teachers should be provided with opportunities to acquire and apply the knowledge, skills, and attitudes inherent in environmental education. At the very minimum, this preparation should include:

    a) basic training in ecology

    b) field and/or laboratory experiences for teachers in the area of environmental science.

    c) knowledge of environmental issues and problems of resource management.

    d) competencies in environmental problem identification, investigation, evaluation, and citizenship action.

    e) opportunities to develop value clarification skills and knowledge of the roles of human values in environmental issues.

2. ... provide instruction and experience with multidisciplinary (infusion) curriculum as well as instructional activities and methods similar to those they might use in their own classrooms.

3. ... provide for an opportunity for preservice teachers to experience a multidisciplinary or infusion model in their own training, i.e., be a receiver in a tertiary infusion model of EE.

4. ... provide instruction on the philosophy and goals of EE and the nature of interdisciplinary and multidisciplinary (infused) EE curricula. Further, teachers should be trained in the implementation of these models.

5. ... provide specific training - particularly at the elementary level - in the use of EE content as a vehicle for teaching basic general education skills, e.g., in language arts, reading, and mathematics.

6. ... provide opportunities for teachers to develop skills in identifying, inventorying, and evaluating local resources for use in environmental education.

E. Lahiry, D.; Sinha, Savita; Gill, J.; Mallik, U.; and Mishra, A.
Environmental Education: A Process for Pre-Service Teacher Training Curriculum Development
Unesco-UNEP: Paris (1988)

Expected Abilities and competencies to be Accomplished by Teaching Methods:

... identify environmental and allied problems/issues in the immediate vicinity and in other places.

... equip themselves with knowledge and skills to locate relevant information related to environmental issues and problems from different sources like the library, media, research and social institutions.

... develop the skills needed to investigate environmental issues and problems.

... assess and evaluate their investigation in terms of its local, regional and global implications both from social as well as environmental points of view.

... think of alternative solutions, if any, resulting from the investigation done by them.

... evaluate alternative solutions.

... successfully argue the decision based on a completed investigation in order to convince others that the decision is a good one.

... participate in group discussions and seminars to promote the results of their study.

... motivate others to conduct similar studies on diverse environmental issue situations.

The training curriculum should prepare trainees to utilize the following teaching methods and strategies in the context of environmental education.

1. Problem solving
2. Experimentation
3. Case studies
4. Out of classroom activities or Field studies
5. Projects
6. Surveys
7. Simulations and role playing
8. Buzz sessions (small group discussion)
9. Brain storming sessions
10. Discussion or debates involving local resources and issues.

F. Hungerford, H.; Volk, T.; Dixon, B.; Marcinkowski, T.; & Sia, A.
An Environmental Education Approach to the Training of Elementary Teachers: A teacher Education Programme
Paris: Unesco-UNEP (1988)

Biological Science

Upon completion of the teacher education programme, the teacher is expected to be able to...

1. ... communicate and apply the major ecological concepts including those focusing on individuals, species populations, communities, ecosystems, biogeochemical cycles, energy production and transfer, interdependence, niche, adaptation, succession, homeostasis, and man as an ecological variable.

2. ... apply a knowledge of ecological concepts to the analysis of environmental issues and identify important ecological principles involved.

3. ... apply a knowledge of ecological concepts in predicting the ecological consequences of alternative solutions to environmental problems.

Written Communication

Upon completion of the teacher education programme, the teacher is expected to be able to...

5. ... understand and communicate how man's cultural activities (e.g. religious, economic, political, social and others) influence the environment from an ecological perspective.

6. ... understand and communicate how an individual's behaviors impact on the environment from an ecological perspective.

10. ... understand the roles played by differing human beliefs and values in environmental issues and the need for personal values clarification as an important part of environmental decision making.

11. ... understand the need for responsible citizenship action in the solution of environmental issues.

12. ... apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered.

16. ... demonstrate the ability to identify and clarify personal value positions related to important environmental issues and their associated solutions.

National History

5. ... understand and communicate how man's cultural activities (e.g. religious, economic, political, social and others) influence the environment from an ecological perspective.

7. ...identify a wide variety of local, regional, national and international environmental issues and the ecological and cultural implications of these issues.

8. ... identify and communicate the viable alternative solutions available for remediating crucial environmental issues as well as the ecological and cultural implications of these various solutions.

15. ... demonstrate the ability to evaluate alternative solutions and associated value perspectives for important issues with respect to their ecological and cultural implications.

18. ... demonstrate a competence with a variety of citizenship action skills from the following categories of skills: persuasion, consumerism, political action, legal action, and ecomanagement.

20. ... demonstrate the ability to apply one or more citizenship action skills for the purpose of resolving or helping to resolve one or more environmental issues.

Philosophy: Introduction to Ethics

10. ... understand the roles played by differing human beliefs and values in environmental issues and the need for personal values clarification as an important part of environmental decision making.

11. ... understand the need for responsible citizenship action in the solution of environmental issues.

Physical Science

5. ... understand and communicate how man's cultural activities (e.g. religious, economic, political, social and others) influence the environment from an ecological perspective.

7. ...identify a wide variety of local, regional, national and international environmental issues and the ecological and cultural implications of these issues.

8. ... identify and communicate the viable alternative solutions available for remediating crucial environmental issues as well as the ecological and cultural implications of these various solutions.

13. ... demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

15. ... demonstrate the ability to evaluate alternative solutions and associated value perspectives for important issues with respect to their ecological and cultural implications.

19. ... evaluate selected actions in light of their ecological and cultural implications.

Environmental Science

2. ... apply a knowledge of ecological concepts to the analysis of environmental issues and identify important ecological principles involved.

3. ... apply a knowledge of ecological concepts in predicting the ecological consequences of alternative solutions to environmental problems.

5. ... understand and communicate how man's cultural activities (e.g. religious, economic, political, social and others) influence the environment from an ecological perspective.

7. ...identify a wide variety of local, regional, national and international environmental issues and the ecological and cultural implications of these issues.

8. ... identify and communicate the viable alternative solutions available for remediating crucial environmental issues as well as the ecological and cultural implications of these various solutions.

11. ... understand the need for responsible citizenship action in the solution of environmental issues.

Principles of Geography

5. ... understand and communicate how man's cultural activities (e.g. religious, economic, political, social and others) influence the environment from an ecological perspective.

13. ... demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

15. ... demonstrate the ability to evaluate alternative solutions and associated value perspectives for important issues with respect to their ecological and cultural implications.

16. ... demonstrate the ability to identify and clarify personal value positions related to important environmental issues and their associated solutions.

Sociology

5. ... understand and communicate how man's cultural activities (e.g. religious, economic, political, social and others) influence the environment from an ecological perspective.

7. ...identify a wide variety of local, regional, national and international environmental issues and the ecological and cultural implications of these issues.

13. ... demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

15. ... demonstrate the ability to evaluate alternative solutions and associated value perspectives for important issues with respect to their ecological and cultural implications.

17. ... demonstrate the ability to evaluate, clarify, and change value positions in light of new information.

Economics

5. ... understand and communicate how man's cultural activities (e.g. religious, economic, political, social and others) influence the environment from an ecological perspective.

8. ... identify and communicate the viable alternative solutions available for remediating crucial environmental issues as well as the ecological and cultural implications of these various solutions.

13. ... demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

Fundamentals of Communication

12. ... apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered.

13. ... demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

16. ... demonstrate the ability to identify and clarify personal value positions related to important environmental issues and their associated solutions.

17. ... demonstrate the ability to evaluate, clarify, and change value positions in light of new information.

20. ... demonstrate the ability to apply one or more citizenship action skills for the purpose of resolving or helping to resolve one or more environmental issues.

Personal/Environmental Health

6. ... understand and communicate how an individual's behaviors impact on the environment from an ecological perspective.

10. ... understand the roles played by differing human beliefs and values in environmental issues and the need for personal values clarification as an important part of environmental decision making.

11. ... understand the need for responsible citizenship action in the solution of environmental issues.

13. ... demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

Science Process for Teachers

9. ... understand the need for issue investigation and evaluation as prerequisite to sound decision making.

11. ... understand the need for responsible citizenship action in the solution of environmental issues.

12. ... apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered.

13. ... demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

14. ... demonstrate the ability to identify alternative solutions for important issues and the value perspectives associated with these solutions.

15. ... demonstrate the ability to evaluate alternative solutions and associated value perspectives for important issues with respect to their ecological and cultural implications.

19. ... evaluate selected actions in light of their ecological and cultural implications.

Language Arts Methods

12. ... apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered.

21. ... demonstrate the ability to effectively implement instructional materials designed to assist the development of environmentally literate students, i.e. students who are both competent with and willing to apply critical environmental knowledge and skills.

Mathematics Methods

12. ... apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered.

21. ... demonstrate the ability to effectively implement instructional materials designed to assist the development of environmentally literate students, i.e. students who are both competent with and willing to apply critical environmental knowledge and skills.

Social Studies Methods

7. ...identify a wide variety of local, regional, national and international environmental issues and the ecological and cultural implications of these issues.

8. ... identify and communicate the viable alternative solutions available for remediating crucial environmental issues as well as the ecological and cultural implications of these various solutions.

9. ... understand the need for environmental issue investigation and evaluation as prerequisite to sound decision making.

10. ... understand the roles played by differing human beliefs and values in environmental issues and the need for personal values clarification as an important part of environmental decision making.

11. ... understand the need for responsible citizenship action in the solution of environmental issues.

12. ... apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered.

13. ... demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.

14. ... demonstrate the ability to identify alternative solutions for important issues and the value perspectives associated with these solutions.

15. ... demonstrate the ability to evaluate alternative solutions and associated value perspectives for important issues with respect to their ecological and cultural implications.

16. ... demonstrate the ability to identify and clarify personal value positions related to important environmental issues and their associated solutions.

17. ... demonstrate the ability to evaluate, clarify, and change value positions in light of new information.

18. ... demonstrate a competence with a variety of citizenship action skills from the following categories of skills: persuasion, consumerism, political action, legal action, and ecomanagement.

19. ... evaluate selected actions in light of their ecological and cultural implications.

20. ... demonstrate the ability to apply one or more citizenship action skills for the purpose of resolving or helping to resolve one or more environmental issues.

21. ... demonstrate the ability to effectively implement instructional materials designed to assist the development of environmentally literate students, i.e. students who are both competent with and willing to apply critical environmental knowledge and skills.

Science Methods

2. ... apply a knowledge of ecological concepts to the analysis of environmental issues and identify important ecological principles involved.

3. ... apply a knowledge of ecological concepts in predicting the ecological consequences of alternative solutions to environmental problems.

4. ... understand the principles of ecology in order to identify, select, and utilize appropriate sources of scientific information in a continuing effort to investigate, evaluate and find solutions for environmental issues.

6. ... understand and communicate how an individual's behaviors impact on the environment from an ecological perspective.

7. ...identify a wide variety of local, regional, national and international environmental issues and the ecological and cultural implications of these issues.

8. ... identify and communicate the viable alternative solutions available for remediating crucial environmental issues as well as the ecological and cultural implications of these various solutions.

9. ... understand the need for environmental issue investigation and evaluation as prerequisite to sound decision making.

G. **Marcinkowski, T.; Volk, T.; and Hungerford, H.**
An Environmental Education Approach to the Training of Middle Level Teachers: A Prototype Programme
Paris: Unesco-UNEP (1990)

In addition to the 21 competencies outlined in the Hungerford, et al (1988) document cited above, the following are proposed:

22. ... demonstrate the ability to organize and implement instruction at each of the four EE goal levels using those teaching strategies which have proven effective, and which are appropriate for use in (middle) school settings.

23. ... demonstrate the ability to design and carry out appropriate assessments of student learning at each of the four EE goal levels in (middle) school settings.

24. ... demonstrate the ability and a willingness to modify one's selection of instructional materials and/or strategies based upon the results of classroom evaluations and assessments.

III. STATE LEVEL EE CERTIFICATION OR ENDORSEMENT REQUIREMENTS

A review of the literature provides a sampling of what writers in the field suggest are environmental educator competencies. It is at the state level that these competencies are put into practice through environmental education teacher certification/endorsement requirements and performance standards. Unfortunately, few states have made formal recommendations concerning what an environmental educator should know and be able to do. Recent state-by-state surveys of environmental education standards (Environmental Education Associates, 1992 and NCEET, 1994) reveal that while some states do certify teachers for life sciences or environmental sciences (e.g. Indiana, Arkansas, Louisiana), only Nevada, Pennsylvania and Wisconsin seem to have developed formal teacher certification/ endorsement requirements for environmental education. In addition, Alaska offers an endorsement for natural resources.

A number of states, however, have written or are currently writing teacher competency guidelines (e.g. Arizona, Texas, Iowa, Washington).

A. Wisconsin Department of Public Instruction An Interpretation of the Competencies in the Environmental Education Rule (circa 1984)

1. Knowledge of the wide variety of natural resources and methods of conserving these natural resources.

Candidates should be able to demonstrate a basic understanding of:

a. air, fuel minerals, non-fuel minerals, plants, soil, water, and wildlife as natural resources;

b. current and projected supplies of these resources;

c. current and projected demands for these resources;

d. management strategies for these resources.

2. Knowledge of interactions between the living and nonliving elements of the natural environment.

Candidates should be able to demonstrate an ability to:

a. communicate major concepts in ecology such as organization (organisms, populations, communities, ecosystems, biomes, etc.), bio-geochemical cycles, energy relationships (food chains, food webs, pyramidal relationships, trophic levels, etc.), population dynamics (limiting factors, cycles, etc.), change (succession, etc.);

b. apply knowledge of ecological principles to the analysis of environmental issues;

c. apply a knowledge of ecological principles to predict the consequences of alternative solutions to environmental problems.

3. Knowledge of the concept of energy and its transformations in physical and biological systems.

Candidates should be able to demonstrate a basic understanding of:

a. the nature of energy;
b. energy states (kinetic and potential) and forms (thermal, radiant, chemical, mechanical, sound, nuclear);
c. renewable and nonrenewable energy sources;
d. energy conversion and transfer;
e. law of conservation of energy and matter;
f. the first and second laws of thermodynamics;
g. the global energy budget;
h. energy flow in biological systems;
i. environmental consequences of energy use.

4. Knowledge of local, national, and global interactions among people and the natural and built environments including:

a. Historical and philosophical review of the interactions between people and the environment.

Candidates should have a basic understanding of the changing role of humans in nature as:

hunter-gathers; agricultural societies; industrial societies; members of a living community (e.g., Leopold's Land Ethic).

b. The social, economic, and political implications of continued growth of the human population.

Candidates should have a basic understanding of:
human population dynamics; human population controls - natural and artificial; the relationship between population size lifestyles, and competition for natural resources; the impact of competition for natural resources on local, national, and global economics and politics.

c. The concept of renewable and nonrenewable resources and principles of resource management.

Candidates should be able to differentiate between renewable and nonrenewable resources and describe appropriate management strategies for each.

d. The impact of technology on the environment.

Candidates should be able to provide examples of positive and negative implications of technology for environmental quality in areas such as:

solid waste generation and disposal; hazardous waste generation and disposal; surface ground water contamination; human-induced climatic changes; air contamination, including acid deposition; food additives; and the nuclear cycle (prospecting through waste disposal) and the generation of nuclear power.

e. How such interactions affect physical and mental well being.

Candidates should be able to describe how living and non-living elements in the environment affect the physical and mental well being of human beings, such as:

the need for beauty in both natural and built environments;
the potential for direct detrimental effects on the physical well being of humans by environmental contaminants; and
the potential for indirect detrimental effects on the physical and mental well being of humans when environmental contaminants affect other organisms.

5. Ability to use affective education methods to examine attitudes and values inherent in environmental problems.

Candidates should be able to:

a. utilize current theories of knowledge/attitude/behavior relationships in selecting, developing, and/or implementing a balanced environmental education curriculum which incorporates values education;

b. utilize affective education methods such as values clarification, and Kohlberg's moral reasoning model in planning and implementing instruction;

c. analyze environmental issues and their associated value perspectives with respect to their ecological and cultural implications;

d. evaluate alternative solutions and associated value perspectives for discrete environmental issues with respect to their cultural and ecological implications;

e. identify their own value positions related to discrete environmental issues and their associated solutions;

f. evaluate, clarify, and change their own value positions in light of new information.

6. Ability to incorporate the study of environmental problems in whatever subjects or grade level programs the recipient of the certificate of license is permitted to teach through the use of the following methodologies: (a) outdoor teaching strategies; (b) simulation; (c) case

studies; (d) community resource use; and (e) environmental issue investigation, evaluation and action planning.

> Candidates should have experienced the use of the methodologies listed and should be able to effectively use each of them in providing instruction about the environment and its associated problems.

7. Knowledge of ways in which citizens can actively participate in the resolution of environmental problems.

> Candidates should be familiar with the possible strategies for citizen involvement in the resolution of environmental issues and problems, such as:
>
> a. persuasion;
> b. consumerism;
> c. political action;
> d. legal action;
> e. ecomanagement;
> f. combinations of these strategies.
>
> Candidates should also be able to develop and/or implement programs and activities which enable students to develop participatory skills needed in each of these strategies.

B. Environmental Education Staff Development Programs: Criteria for Selection
Texas Environmental Education Advisory Committee
Austin, TX: Texas Education Agency (1993)

The Texas Environmental Education Advisory Committee offers teachers the opportunity to earn a Recognition of Accomplishment in Environmental Education Certificate. The certificate is granted after a teacher participates in 45 hours of environmental education from approved programs. To be endorsed by the TEEAC, programs must provide documentation concerning the domains, competencies, and methodologies to be covered. The following are to be used for planning purposes by program designers:

Ten Core Themes of Environmental Education:

Environmental Health and Hazards
Aesthetics and the Built Environment
Communities and Ecosystems
Plants, Food, and Fiber
Water Quality
Human Populations and Society
Air Quality

Wildlife and Domestic Animals
Soil and Land Use
Minerals, Energy, and Resource Recovery

Environmental Education:

- Ecological Concepts
    - Principles of Interdependence
        - Abiotic (e.g., thermodynamics, dynamic earth models, cycles)
        - Biotic (e.g., trophics, niche, carrying capacity, evolution, biodiversity)
- Applications of Ecological Concepts
    - Environmental Philosophy
        - Balance of Nature
        - Conservation Attitudes
        - Conservation Responsibilities
    - Human Impact
        - Human Impact on Environment
        - Human Consumption Patterns
        - Historical Perspective of Human Impact
        - Population Expansion
        - Human Settlement Patterns
    - Resource Management
        - Resource Useage Consequences
        - Renewable Resources Impacts
        - Nonrenewable Resources Impacts

C. Arizona Department of Education
Environmental Education Program Guidelines for Teacher Education
Phoenix, AZ (1994)

Goals and Objectives

In developing these Environmental Education goals and objectives for teacher education, the committee utilized the K-12 Environmental Education Program Guideline's goals. The K-12 Program Guideline goals were based on the "Literacy Framework for Environmental Education" from the Governor's Task Force's Comprehensive Plan for Environmental Education.

Ecological Systems and Interrelationships

Goal A: Understand that all living and non-living elements of an ecosystem are interdependent.

Goal B: Understand that habitat, carrying capacity and limiting factors influence plant and animal populations, including humans.

Goal C: Understanding of change as a fundamental characteristic of ecosystems.

Goal D: Understand that our planet is naturally diverse in species and habitats but that this diversity may be threatened by human activities.

Goal E: Understand that humans are a natural component of many ecosystems.

Resources and Resource Management

Goal A: Understand what natural resources are, how natural resources affect humans and how humans affect natural resources. Also understand that these effects can range from positive to negative.

Goal B: Understand what natural resources management is, how and why humans manage natural resources, and how this management affects humans. Students will further understand that management decisions are based on human-defined goals, values and needs.

Goal C: Understand that energy is a natural resource and has various transformations in physical and biological systems.

Environmental Issues

Goal A: Understand relationship of humans to their natural and artificial surroundings.

Goal B: Understand the relationship of humans to local change and global impact in population, pollution, resource allocation, resource depletion, conservation, transportation, technology and urban and rural planning to the environment.

Goal C: Understand that the environment has helped shape historical and cultural attitudes, values and the ethics of decision-making of all peoples, past and present. In turn, these belief systems have caused an impact upon the environment.

Goal D: Understand that a healthy environment is dependent upon responsible human action.

Certification for Teachers in Environmental Education

A. 2d. Demonstrate knowledge of ecological concepts, resource utilization and environmental issues.

2e. Demonstrate methods of teaching which will:

i. increase awareness of environmental issues.
ii. Promote knowledge of environmental concepts.
iii. Develop positive attitudes and values towards the environment.
iv. Encourage civic and social responsibility toward environmental issues.

IV. GUIDELINES PROPOSED AS PART OF OTHER STANDARDS DEVELOPMENT PROJECTS

Looking to teacher standards developed previously by other projects provides another current of thought to consider. Three of the four sets of competencies listed below have their roots within science education. The first, developed by NSTA, suggests standards for science teachers who include environmental education as a component of their instruction. The second, developed as part of the national science standards project, outlines what a science teacher should know and be able to do. It is reasonable to assume that there would be considerable overlap between these performance standards and those developed for environmental education. The last of these, also developed as part of the national science standards project, focuses on assessment. Although assessment standards can, and perhaps should, be addressed separately, they also relate directly to the educators' performance. Finally, draft standards developed as part of the ASTM process are included. These guidelines drew heavily from the literature, especially that written by Hungerford, et al. (1988).

A. National Science Teachers Association
Criteria for Excellence in Environmental Education
Criteria for Excellence, Revised Edition

Effective environmental education depends on multidisciplinary instruction but has a strong science component. It involves minds-on direct contact with environments as well as vicarious experiences. The learner grows from awareness and understanding to concern and action.

Goal

To develop and practice creativity and critical thinking along with values analyses. Teachers and learners will search for alternative solutions to environmental issues and evaluate the ethical, social, ecological, and economic costs and benefits of alternatives.

Curriculum

1. Provides activities and information in which people interact with the environment;
2. Develops in the students the intellectual tools to effectively explore the world around them;
3. Directly involves students in investigating the world around them and their relationship to it.

Instruction

1. Fosters open minds and the generation and examination of alternatives;
2. Stimulates and fosters creativity and critical thinking;
3. Respects the social, intellectual, and developmental maturity of learners;
4. Links science with other areas of intellectual and emotional activity;
5. Provides opportunities for students to be involved in environmental activity at an appropriate level of challenge; hence, fosters a growing sense of confidence that groups and individuals can positively affect the environment;
6. Relates the components of the ecosystem to our health, well-being, and potential for development.

Evaluation

Effective programs and materials provide

1. Evaluation design based on stated goals, objectives, and outcomes;
2. Field testing of programs and materials in terms of stated goals and objectives;
3. Continuous modification and feedback.

Teachers

1. Distribute EE guidelines to colleagues;
2. Encourage colleagues to increase their environmental literacy;
3. Hold clearly stated goals and objectives for learner behavior;
4. Treat controversial issues fairly and honestly;
5. Teach people how to think, not what to think.

B. ASTM
Formal Education Committee, Teacher Education Task Group (April 1991)

Environmental Education Teacher Education Standards (Draft)

Ecological Foundations: The environmental educator should be able to...

1....communicate and apply major ecological concepts (e.g. individuals and species, populations, communities and ecosystems; biogeochemical cycles; energy production, storage, transfer and degradation; interdependence; niche; adaptation; succession; homeostasis; and human as an ecological variable).

2...communicate the usefulness of ecological concepts in understanding human dependence on a stable, productive ecosystem for survival.

3...identify important ecological principles involved in environmental problems and issues.

4...predict the probable ecological consequences of alternative solutions to environmental problems and issues.

5...identify, select and utilize appropriate sources of scientific information in a continuing effort to investigate, evaluate and develop solutions for environmental problems and issues.

Conceptual Awareness

6...describe how human cultural activities (e.g., religious, economic, political, social, and others) influence the environment from a ecological perspective.

7...describe how people's behaviors, individually and collectively, impact upon the environment from an ecological perspective.

8...identify a wide variety of environmental issues and describe the ecological and cultural implications of those issues.

9...identify various alternative solutions available for particular environmental issues and describe the ecological and cultural implications of those solutions.

10..describe the roles played by differing beliefs and values in environmental issues.

Issue Investigation and Evaluation

11..investigate environmental issues using both primary and secondary sources of informatio (e.g., generate research questions; develop a survey; plan a data collection strategy; organize data into charts/tables/graphs; generate data-based conclusions, inferences and recommendations; communicate research findings).

12..analyze environmental issues, their associated values and beliefs, and their ecological and cultural implications.

13..evaluate alternative solutions with respect to their ecological and cultural implications.

14..identify, evaluate, and modify (where appropriate) personal value positions with respect to environmental issues and solutions.

Environmental Action

15..develop a plan for personal involvement in attempting to remediate environmental issues, using the following strategies: persuasion, consumer action, political action, legal action, and eco-management (physical action).

16..evaluate specific action strategies with respect to personal, ecological, and cultural implications.

Instructional Applications

17..apply a knowledge of educational philosophy to the selection, development, and implementation of curricular programs and strategies to achieve both general education and environmental education goals.

18..utilize current theories of moral reasoning and valuing processes in selecting, developing, and implementing curricula which will effectively achieve accepted goals of environmental education with a variety of learners.

19..utilize current theories of knowledge/attitude/behavior relationships in selecting, developing, and implementing a balanced curriculum which maximizes the probability of desired behavior changes in learners.

20..utilize current theories of learning (e.g., Piaget, Bruner, Gagne) in selecting, developing, and implementing curricular materials and teaching strategies to effectively achieve environmental education goals with a variety of learners.

21..apply the theory of transfer of learning in selecting, developing and implementing curricular materials and strategies to insure that learned knowledge, attitudes and cognitive skills will be transferred to life style decision-making by learners.

22..develop and use effective means of planning and managing instruction (e.g., designing instructional units; managing small and large instructional groups, dealing with controversial issues, etc.)

23..select and implement effective instructional methodologies which are appropriate for desired cognitive, affective, and behavioral outcomes and a variety of learner characteristics (e.g., outdoor education methods, affective education methods, simulation games and role playing, case studies methods, community resource use, etc.)

24..infuse environmental education curricula and methods into other disciplines when appropriate.

25..evaluate environmental education curricula and methods with respect to learner achievement in cognitive, affective, and behavioral dimensions.

26..foster environmental sensitivity in learners, utilizing current research in that area.

C. National Committee on Science Education Standards & Assessment
National Science Education Standards: July '93 Progress Report
National Research Council: Washington, DC (July 1993)

NOTE: Since this was a "progress report," it represents only an outline of the points under discussion. The Teaching Working Group reports that they envision standards to be divided into three major areas: the structure of science teaching, the skills and knowledge science teachers must have, and the professional development program that must be in place for teachers to gain and maintain this skill and knowledge base. The July 1993 document outlines in further detail the first area of concern only: the structure of science teaching.

The Structure of Science Teaching

1. Planning and Developing Science Curriculum. This category includes the work that teachers do as they select and organize the content for science teaching.

> a. ... plan and design, evaluate and select science curriculum for their students that reflect the content standards and the range of ways that diverse students learn science. ... appropriate to students' levels of development and is connected to and sensitive to students' experiences, family, culture, community, and prior understanding.... rich and challenging inquiry and flexible and open to the contributions of students. The content ...composed of significant and accurate science; relate to social and historical contexts; show science as a human endeavor; and reflect thoughtful coordination across science domains and with other curriculum areas.
>
> b. ... select and design teaching strategies that reflect both the nature of science and the ways their students learn. ... flexible and open to the ideas, strengths, and needs

of students and that they engage students in inquiry, providing sufficient time for extended investigations. Strategies must also enable students to construct their knowledge in a social environment and communicate their ideas in many forms. Teaching strategies support students in using and making connections to other disciplines.

2. Creating and Supporting the Learning Environment. This category includes the work that teachers do to develop and maintain learning environments that function as communities of learners and resemble workshops or laboratories.

a. ... work with their students to create a social and intellectual community of learners that encourages science learning, promotes appreciation of scientific exploration and discoveries, and provides an intellectually open, stimulating, and exciting environment.

b. ... design the physical environment to support learning.

3. Guiding and Facilitating Student Learning. This category includes the on-going daily work that teachers do with students to support science learning.

a. Teachers of science recognize the diversity of students within the classroom, reflect sensitivity to diversity in words and actions, and support the full participation of all students.

b. ... create opportunities for students to take responsibility for their own learning and work collaboratively by encouraging students to pursue their own ideas individually and in groups; guiding students in the skills and uses of self-assessment; providing for collaborative group work; and requiring presentations of work accomplished.

c. ... interact with students as they pursue their inquiries ... decide when and how to guide... help students focus on making sense of their experiences...

d. ... promote and model curiosity, excitement, wonder, and imaginations as habits of mind in science learning...

4. Assessing and Reflecting on Student Learning. This category concerns the work that teachers do to assess students' understanding for a variety of purposes, formally and informally, individually and in groups.

a. ... engage in on-going assessments of learning and teaching...

b. ... employ a variety of assessment strategies including observing and listening to students as they work; discussing students' ideas and conceptions; asking students questions ...

c. ... develop a set of criteria to use in the analysis of students' work ...

5. Collaboration for Science Learning. This category includes the work that teachers do as they interact with colleagues and the larger community.

a. ... do not do their work alone, but work actively with other members of the school and larger community ...

D. National Committee on Science Education Standards and Assessment
National Science Education Standards: July '93 Progress Report
National Research Council: Washington, DC (July 1993)

Assessment

Proposed Principles:

1. At every level of science education, as much attention is given to the assessment of opportunity to learn as to the assessment of student attainment.

2. The form of science assessment follows its function.

3. Assessment data are well matched to the goals of science education.

4. The psychometric characteristics of assessment are adequate to support the interpretations made from the data.

5. The primary responsibility for the assessment of student attainment resides with teachers.

6. Assessment practices are fair.

7. Performance standards are public.

8. Assessment practices throughout the system are internally consistent.

Standards Under Development:

1. Assessment in the Service of Teaching and Learning: From the Teacher's Perspective. This standard will address the ways teachers assess students in order to plan and modify instruction; assess students in order to communicate with parents, administrators, and other teachers about student attainment; and monitor their own teaching performance in order to improve their teaching competence.

2. Assessment in the Service of learning: From the Students Perspective. This standard describes how developing students' ability to assess their own learning becomes a valuable tool to enhance their learning.

3. Assessment for Decisions about Individuals. This standard will address ways in which all assessments, especially those that have high stakes attached to them, will be fairer and more equitable for all students.

4. Assessment in the Service of Policy. This standard will address ways in which science assessment can become an effective tool for policy development and implementation. Expectations are often communicated more effectively by assessment tasks than by words alone. ...assessment strategies must focus on all the priority goals for science education.

5. Assessment to Monitor the System. This standard will address ways in which the principle of equal attention to assessment of opportunity to learn and assessment of attainment can be put into practice.

V. A SYNTHESIS OF THE GUIDELINES: TOWARD A FRAMEWORK FOR ENVIRONMENTAL EDUCATOR PERFORMANCE STANDARDS

Looking at the various guidelines, no particular structure or model for the development of environmental educator performance standards is readily evident. Some of the guidelines are simply listings of desirable attributes. Others were developed as suggestions for pre-service teacher training and are, therefore, organized around college level courses. While others have formed categories of competencies, including knowledge base, teaching methods, learning environment, and assessment.

Although perhaps a bit arbitrary, the environmental educator competencies have been divided into six themes: A) Learner Knowledge and Skills Base, B) Educational and Psychological Foundations, C) Environmental Education Foundations, D) Instructional Methodologies, E) Learning Environment, and F) Assessment.

A. Learner Knowledge and Skills Bases

The competencies in this category relate directly to the educators' understanding of the content of environmental education. That is, does the educator have sufficient background for teaching the various concepts and process skills inherent in environmental education. The competencies are drawn directly from the student performance standards (see Working Paper #2) that outline what students should know and be able to do.

An environmental educator should have the knowledge and skills necessary to teach about:

AFFECT

Environmental sensitivity or appreciation;

Attitudes: toward pollution, technology, economics, conservation, and environmental action;

Willingness to recognize and choose among differing value perspectives associated with problems and issues;

Motivation to actively participate in environmental improvement and protection;

Moral Reasoning: making decisions and judgments about environmental issues according to one's own sense of morality;

Values clarification.

ECOLOGICAL KNOWLEDGE

Communicate and apply the major ecological concepts including those focusing on individuals, species, populations, communities, ecosystems, biogeochemical cycles, energy production and transfer, interdependence, niche, adaption, succession, homeostasis, and man as a ecological variable;

A knowledge and understanding of how natural systems work, as well as of how social systems interface with natural systems;

Change and limiting factors (change as a natural process; biotic and abiotic limits to growth, size, and distribution of population).

SOCIO-POLITICAL KNOWLEDGE

Clear awareness of economic, social, political and ecological interdependence in urban and rural areas;

Understand and communicate how human cultural activities (e.g., religious, economic, political, social and others) influence the environment from an ecological perspective;

Understand the relationship between beliefs, political structures, and environmental values of various cultures;

Understand the basic components of societal systems;

Geographic understanding at the local, regional, and global levels;

Understand patterns of change in society and culture;

Understand structure and scale in societies and culture.

KNOWLEDGE OF ENVIRONMENTAL ISSUES

An understanding of the various environmentally-related problems and issues (local, regional, national, international, and global);

Air Quality (ozone depletion; global warming; acid deposition; air pollution);

Water Quality and Quantity (water pollution; use and management);

Soil Quality and Quantity (soil depletion and pollution; use and management);

Wildlife and Habitat;

Energy;

Land Use;

Human Population and Health;

Waste.

SKILLS

Identifying and defining problems;

The skills required to analyze, synthesize, and evaluate information about environmental problems/issues using primary and secondary sources, and to evaluate a select problem/issue on the basis of evidence and personal values;

Skills for dealing with action strategies: including selecting appropriate action strategies, creating an action plan, evaluating an action plan, and implementing an action plan;

Conducting basic risk analysis;

Thinking in terms of systems;

Using ability to forecast, to think ahead, plan.

DETERMINANTS OF ENVIRONMENTALLY RESPONSIBLE BEHAVIOR

Locus of control;

Assumption of personal responsibility (includes recognition that one's negative behavior has a negative effect on the environment and, likewise one's positive behavior can have potentially positive effects on the environment; acceptance of personal responsibility for negative environmental effects or impacts; willingness to help correct negative environmental impacts and resolve environmental impacts and issues).

ENVIRONMENTALLY RESPONSIBLE BEHAVIORS

Active participation aimed at solving problems and resolving issues;

Environmentally sound consumer purchasing (consumerism);

Methods for conserving resources (ecomanagement);

Assisting with the enforcement of environmental regulations (legal action);

Using personal and interpersonal means to encourage environmentally sound practices (persuasion);

Encouraging environmentally sound policies and legislative initiatives (political action).

B. Educational and Psychological Foundations

Environmental educators teach in a number of different types of settings. Although many do not teach in a formal school setting, it is important that they understand fundamentally about the learning process and child development. Consequently, an environmental educator should be able to demonstrate competencies involving educational and psychological foundations, such as:

..apply a knowledge of educational philosophy to the selection, development, and implementation of curricular programs and strategies to achieve both general education and environmental education goals.

..utilize current theories of moral reasoning and valuing processes in selecting, developing, and implementing curricula which will effectively achieve accepted goals of environmental education with a variety of learners.

..utilize current theories of knowledge/attitude/behavior relationships in selecting, developing, and implementing a balanced curriculum which maximizes the probability of desired behavior changes in learners.

..utilize current theories of learning (e.g., Piaget, Bruner, Gagne) in selecting, developing, and implementing curricular materials and teaching strategies to effectively achieve environmental education goals with a variety of learners.

..apply the theory of transfer of learning in selecting, developing and implementing curricular materials and strategies to insure that learned knowledge, attitudes and cognitive skills will be transferred to life style decision-making by learners.

..consider both the physical and intellectual development of the student in the planning of EE experiences.

..apply characteristics of cognitive knowledge with special emphasis on concept development.

..apply characteristics of cognitive process, i.e. intellectual skills such as inferring, hypothesizing, data collection and analysis, drawing of conclusions.

..provide opportunities for students to be involved in environmental activity at an appropriate level of challenge.

C. Environmental Education Foundations

Environmental education is a separate field. As such, it holds its own traditions and ways of constructing education. Environmental educators should have a grounding in the history, philosophy, and theory of EE. They should be able to:

... demonstrate an understanding of the history, philosophy, and theory of environmental education.

... infuse environmental education curricula and methods into other disciplines when appropriate.

... utilize EE content as a vehicle for teaching basic general education skills, e.g., in language arts, reading, and mathematics.

D. Instructional Methodologies

This category involves competencies with the selection and use of various instructional methodologies. The educator should be able to:

... select effective instructional methodologies which are appropriate for desired cognitive and affective outcomes, receiver characteristics and available facilities.

...utilize a variety of teaching methods and strategies in the context of environmental education, including problem solving; experimentation; case studies; outdoor education methods; affective education methods (e.g., values clarification, moral dilemma); simulation games; community resource use; surveys; projects; discussion and debates; methods of independent student and/or group problem identification, investigation, evaluation and action planning for resolving environmental issues.

...develop and use effective means of planning and managing instruction (e.g. designing instructional units; managing small and large instructional groups, dealing with controversial issues).

...directly involve students in investigating the world around them and their relationship to it.

... stimulate and foster creativity and critical thinking

E. Learning Environment

No matter what the context, providing a positive learning environment is critical. Environmental educators should:

... respect the social, intellectual, and developmental maturity of learners.

... develop and maintain learning environments that function as communities of learners and resemble workshops or laboratories

... work with their students to create a social and intellectual community of learners that encourages environmental learning, promotes appreciation of exploration and discoveries, and provides an intellectually open, stimulating, and exciting environment.

... design the physical environment to support learning

... recognize the diversity of students within the classroom, reflect sensitivity to diversity in words and actions, and support the full participation of all students.

... create opportunities for students to take responsibility for their own learning and work collaboratively by encouraging students to pursue their own ideas individually and in groups; guiding students in the skills and uses of self-assessment; providing for collaborative group work; and requiring presentations of work accomplished

... promote and model curiosity, excitement, wonder, and imaginations as habits of mind

F. Assessment

If educators are to know whether the environmental education program has been effective, they must be familiar with assessment. Although some assessment is implemented at the district or state level, the effective educator is able to determine both formally and informally whether student performance meets expectations. The environmental educator should be able to:

...engage in on-going assessments of learning and teaching with respect to learner achievement in cognitive, affective, and behavioral dimensions.

...employ a variety of assessment strategies including observing and listening to students as they work; discussing students' ideas and conceptions; asking students questions.

... develop a set of criteria to use in the analysis of students' work.

... develop assessment practices that are fair.

Working Paper #4

Proposed National Environmental Education Materials Development Standards

Preface

This paper presents an examination of existing guidelines for the development or evaluation of environmental education materials. In addition, an attempt has been made to draft a synthesis of these guidelines that may direct the creation of a model set of environmental education materials development standards. The purpose is to provide an overview of relevant work in this area, and to spur deliberation.

I. DEVELOPING A FRAMEWORK FOR ENVIRONMENTAL EDUCATION MATERIALS STANDARDS

As with the environmental educator performance standards, environmental education materials development standards are related integrally to student performance standards. Defining what children should know and be able to do determines, to some degree, what curricula and program materials need to encompass. But to be effective, environmental education materials standards need to involve more than content recommendations. Materials standards must also consider various aspects of curriculum design, the learner, presentation, and assessment.

There is a substantial literature related to evaluating the effectiveness of specific EE curriculum projects. Typically, these pieces report out on whether participants increased along the dimensions intended (e.g. affect, cognitive, behavior). There has been far less work done, however, on the issue of creating guidelines or standards that can be used consistently to evaluate the design and content of a broad spectrum of EE curriculum or to direct its development.

The authors of the California Compendium Series succinctly explain the need for guides that help the teacher review or evaluate curriculum projects:

> Environmental education curriculum materials are, by their very nature, interdisciplinary. The wide spectrum of environmental topics and issues addressed in textbooks and supplementary materials alike are often interrelated. As more and more materials emerge to address environmental issues, teachers are in a quandary over which curriculum materials to choose.

To facilitate discussion of EE materials standards, proposed guidelines will be divided into: 1) those developed as reviews or evaluations of curriculum materials, and 2) those related to the development and use of curriculum materials. As with other working papers in this series, guidelines will be presented in chronological order.

II. GUIDELINES FOR CURRICULUM REVIEW OR EVALUATION

A. Gardella, R.
Environmental Education Curriculum Inventory
Northern Kentucky University (1986)

How well would the materials case student users to:

I. Know facts, concepts, principles of ecology.

II. Know about and investigate environment problems.

III. Know about and practice environmental action.

IV. Do the materials reflect recommended teaching methods and perspectives such as:

a. Using "hands-on", direct experience teaching methods

b. Being on the appropriate educational level for student users.

c. Being current and accurate

d. Adequately evaluating the stated lesson or program objectives.

e. Having adequate directions and thus easy to use.

B. California Department of Education
Environmental Education compendium for Energy Resources
Sacramento, CA (January 1992)

TEACHING AND LEARNING

PEDAGOGY

1. Do the materials encourage hands-on experience?

2. Do the materials offer the students the opportunity to practice scientific thought processes (e.g., hypothesis making, problem solving, collecting and organizing data, analyzing, drawing conclusions)?

3. Is the content treated accurately?

4. Are concepts organized thematically?

5. Do the instructional materials offer opportunities for different learning modes?

6. Are concepts open to inquiry, presented non-dogmatically?

7. Are assessment devices appropriate?

8. Are the concepts being taught related directly to the students' problem solving experiences?

9. Is the learning environment expanded, using the out-of-doors, field trips, outside speakers, etc.?

GENERAL CONTENT

10. Is the depth of treatment of the material adequate?

11. Is the material appropriate for the age level designated?

12. Are materials relevant to both rural and urban settings?

13. Are individual values included, as they pertain to the subject?

14. Are knowledge and learning shown as an enterprise connected to society?

PRESENTATION AND ORGANIZATION

15. Are the objectives clearly stated?

16. Are instructions for teachers clear?

17. Can the materials be adapted to varied learning environments (large or small class, mixed level classes, etc.)?

18. Is the writing engaging?

19. Can these materials be readily integrated into an already established curriculum?

20. Do the materials follow a natural progression?

21. Are the materials organized in an easy-to-use fashion?

22. Are student materials sufficiently supplied?

23. Are there suggestions for further investigations?

24. Are there good visual illustrations?

25. Are the materials called for reasonably accessible?

ENERGY CONTENT

26. Are the laws of thermodynamics addressed?

27. Is the flow of energy through ecosystems included?

28. Are various energy sources (solar, wind, hydro, conservation, geothermal, nuclear, oil, coal, natural gas, O.T.E.C., biomass) treated?

29. Are renewable and nonrenewable energy sources compared and contrasted?

30. Do lessons include actual student participation in energy conservation?

31. Do the materials help students understand the roles of individuals, families, communities, government, in forming energy policy?

32. Is consideration given to long-term benefits and costs?

33. Relative to other energy curriculum you've seen how would you rate this?

a)top 5 b)top 10 c)top 20 d)not in the top 20

Narrative responses please:

34. What stands out about these materials?

35. What are the greatest strengths?

36. What are the greatest weaknesses?

37. Please note any other reactions you may have to this curriculum material.

C. **California Department of Education**
Environmental Education Compendium for Integrated Waste Management
Sacramento, CA (June 1993)

Criteria for Instructional Materials

General Content

1. Are ideas expressed through unifying themes and big ideas, not facts?

2. Is content interdisciplinary?

3. Are students challenged to utilize higher level thinking processes (i.e., inferring, relating, and applying)?

4. Are ideas presented logically and connected through the curriculum?

5. Is depth of understanding emphasized (rather than encyclopedic breath)?

6. Are historical, ethical, cultural, geographic, economic, and sociopolitical relationships addressed?

7. Are knowledge and learning shown as connected to students' lives and society?

Presentation

1. Are instructional materials clearly and engagingly written with the main concepts well articulated?

2. Are the roles of environmental ethics, citizenship, and stewardship explored?

3. Do lessons promote respect and caring for the environment, yet are non-dogmatic and open to inquiry and differences of opinion?

4. Are personal and societal values and conflicting points of view explored in context?

5. Are instructional materials easy for students to use and understand?

6. Is learning made accessible to LEP students?

7. Are writing and concepts developmentally appropriate for the designated grade, yet sensitive to individual differences in educational experience and learning mode?

8. Is environmental responsibility modeled in design, underlying philosophy, and suggested activities by the lessons and materials (e.g., using recycled materials and properly disposing of wastes)/

9. Are there clear linages presented between communities of all levels ("thinking globally, acting locally")?

10. Are vocabulary words defined in context and no dominating of learning goals?

11. Is the layout of instructional materials interesting and appealing?

Pedagogy

1. Does almost half the curriculum have students engaged in active learning?

2. Is learning based on students constructing knowledge through research, discussion, and application to gain conceptual understanding?

3. Are evaluation devices included and appropriate? (Highest points for authentic, performance based assessment devices.)

4. Are instructional materials sensitive to social, economic, and cultural diversity?

5. Do lessons encourage students to develop awareness, knowledge, and strategies for resp. action?

6. Are group/cooperative learning strategies used?

7. Is intergenerational responsibility, linking today's actions with future consequences, implicit in instruction?

Presentation

1. Are instructions for the teacher clear and concise?

2. Are lesson objectives/outcomes clear and appropriate?

3. Are materials easily integrated into an established curriculum?

4. Is background information for the teacher adequate and accurate?

5. Can the materials be adapted to varied learning environments (large/small classes, of mixed levels, from rural/urban settings)?

6. Are consumable instructional materials of good quality, easily duplicated for student use, and in sufficient quantity to support the objectives?

7. Are equipment/materials listed and reasonably accessible?

8. Are a variety of instructional strategies, expanded learning environments, and resources suggested in the curriculum's design?

9. Is the time required to complete each lesson indicated?

10. Do the materials clearly list the subject discipline(s) integrated into each lesson?

Hazardous Waste Content

(lists ten questions related directly to teaching about hazardous wastes)

Solid Waste Content

(lists ten questions related directly to teaching about solid wastes)

Narrative/Miscellaneous

A. Briefly comment on the strengths of the curriculum.

B. Briefly comment on the weaknesses of the curriculum.

C. Other Comments.

D. If it focused on a specific geopolitical area not including California, can it be easily adapted to the needs of California classroom teachers?

E. Are materials available in more than one language? If so, what part of the curriculum and which languages?

F. Do the materials contain a listing of resources, such as an appendix or teacher resource guide?

G. In the table below, place a check mark in the appropriate box next to each discipline to estimate the amount of emphasis each is given in the curriculum.

	None	Some	A lot	Major Emphasis
Science				
History/Soc. Science				
Health				
Mathematics				
Fine/Performing Arts				
Language Arts				
Industrial Tech/Voc Ed				
Foreign Language				

D. Western Regional Environmental Education Council
Guidelines for Programs or Projects Submitted to WREEC for Evaluation (September 1993)

Content, Presentation and Pedagogy

These guidelines offer a template for evaluating whether a program/product provides effective instructional methods, core environmental concepts, and developmentally appropriate activities.

1. Organization of materials emphasize the integrated nature of learning. Environmental concepts are integrated with science, social sciences, history, language arts, economics, mathematics, music and the arts.

2. Program or project engages students in the study of problems of human alternations of the natural environment and encourages their search for potential solutions.

3. Activities allow students to experience the problem-solving process in meaningful contexts and challenges students to develop consensus building/decision-making skills.

4. Organization of materials delineate concepts by discipline enabling teachers to correlate them easily with their state accountability guidelines.

5. Organization of materials allows for exciting, meaningful, integrated learning experiences.

6. Materials are developmentally appropriate for target audience. (The program addresses the needs of lower ability students while introducing them to local environmental problems. More challenging activities engage students in issue analysis, action planning, strategy development, and execution.)

7. Program/product engages students in independent study as well as cooperative and group learning.

8. Program/product utilizes an array of state-of-the-art kinds of assessment including, but not limited to, open-ended questions, journals, portfolios, long-term research projects and other forms of performance-based assessment.

9. Materials are free from racial, ethnic, and gender bias.

10. Program/product is sensitive to the cultural richness of ethnic and racial groups.

11. Materials, where possible, include a listing of resources available for teachers pertinent to the subjects being taught.

12. Materials do not promote agency or organizational policies, nor political points of view.

13. The opinion or policy of an agency or organization, if included, is clearly identified.

14. Program has a hierarchial approach for instructional materials including the following four levels of activities:

> Ecological concepts
> Conceptual Awareness
> Issues Investigation and Evaluation
> Environmental Action Skills
> (see ERIC/SMEAC #4, 1988: "Environmental Education that makes a difference-knowledge to behavior change.")

15. Program includes opportunities for student generated projects.

16. Program has appropriate reading levels for its materials.

17. Curriculum materials carry students to conclusions and application.

18. Program presents a balanced variety of perspectives about issues.

19. Materials have a conceptual orientation to curriculum rather than a focusing on specific facts.

20. Materials utilize diverse instructional approaches to meet various learning styles.

Research and Evaluation

Research and Evaluation establishes the validity and effectiveness of the program in meeting its education objectives.

1. Plan incorporates a pilot test of the product and data from the pilot test are made available to WREEC upon request.

2. Plan includes an ongoing evaluation of program's/product's effectiveness in achieving desired student outcomes.

3. WREEC members have an opportunity to preview the program/product which may include evaluation and piloting.

Management, Implementation and Development

These guidelines delineate WREEC's expectations of the administration, organization and supervision to be rendered in the creation and implementation of a prospective program/product.

1. State-wide committees play an integral role, from beginning to end, in the implementation and development of the program/product. Committee composition should include representation from administration, educators, scientists, and resource managers.

2. A plan specifies how the program/product will be disseminated and integrated into the curriculum.

3. Members of historically-under represented groups, especially minorities and females, are intimately involved in development and implementation. The issues of equity and equal access to program are considered in implementation.

4. If appropriate to the specific program, implementation should encourage integration of environmental concepts across appropriate curriculum subject areas throughout grades K-12.

5. Program development considers all appropriate learning mediums and incorporates current technologies.

6. Program encourages teams of educators representing district, county, or state offices of education to attend implementation workshops.

7. Implementation plan provides hands-on workshops for educators who will use the materials.

Funding

These guidelines aide in identifying the funding sources which will be used by the submitter of the program for its development and implementation (including contributors and sponsors, as well as establish the financial stability of the program).

1. Submitter will disclose program or project development funding sources.

2. Submitter establishes a financial plan, budget, and time-line for the development of the program or project.

3. Submitter establishes the source of financial support for distribution and implementation of the program or project.

4. Submitter must acknowledge its corporate contributors and sponsors of the program or project.

5. If the submitter seeks a partnership with WREEC, there is shared copyright, representation in management of the program or project, and ongoing financial compensation.

E. Environmental Protection Agency
Environmental Science Education Materials Review Guide
Washington, DC (February 1994)

Need for the Material

1. Has the developer clearly identified the need for this material?

2. Has the developer identified the target audience?

3. Are you aware of similar materials that adequately address the need identified?

4. In your judgment, is there a need for this material?

Technical Content

1. Is the content technically accurate? If not, what would be changed?

2. Does the material reflect EPA policy on the topics explored?

3. If there are scientific/technical differences of opinion or competing theories on a topic, are the differences identified and presented in a balanced way?

4. Is the content presented in a way that stimulates student curiosity/leads to more questions? Does it include the information necessary to satisfy student curiosity?

5. Does the approach synchronize with basic scientific methodology, i.e., include developing hypotheses, collecting and using evidence, designing investigations and processes, etc.? Does it stress observation?

6. Does the content include some historical context for major concepts/ideas and demonstrate the evolutionary nature of science? For example, until we discovered how to grind glass, making a telescope was impossible. And until we learned how to use telescopes...

7. Is the content presented in a way that students can relate it to their everyday lives? Is it relevant? If not, why?

8. Are concepts explained and technical terms defined when first introduced and in plain language?

Material Design

1. Were education design specialists (as well as technical experts) involved in the design and preparation of the material?

2. Are the critical or central learning objectives clearly identified? They should be stated in terms of realistic, relevant outcomes (what the students will know/be able to do)?

3. Is the contents appropriate for achieving these objectives?

4. Do the objectives appear to be consistent with national guidelines (e.g., those developed by NEAP, Project 2061, National Research Council)?

5. Does the design encourage (provide tools for) teachers to allow students to investigate and discuss issues and to form and express opinions about the reasonableness of competing theories? (For example, there are valid scientific arguments that production of greenhouse gases will result in global warming and equally valid arguments that they will result in global cooling.)

6. Is the structure logical, i.e., would the overall purpose, direction, and logic of the presentation be clear to teachers and students?

7. Are examples included in the text appropriate to the content, clear, and easily understood?

8. Are maps, graphs, and charts useful, clear, and easy to read? Are photographs sharp and clear?

9. Is the material attractively packaged? Would it be easy for teachers to keep and use - for example, loose-leaf, 8.5" X 11", 3-hole punched, able to lie flat on the desk, easily reproducible?

Educational Methods

1. Does the approach recognize the multi-disciplinary nature of environmental education, i.e., do lessons suggest tie-ins with other subject areas, such as the science disciplines, history, social studies, English, etc.?

2. Can individual lessons be used independently? Can they be integrated into an existing curriculum?

3. Are important concepts conveyed in more than one way (visual, auditory, tactile), so that students who learn differently can understand them?

4. Can the material be described as "hands-on" (interactive)? Does it include lots of examples and opportunities for student experience - for example, using music, art, poetry, and drama or involving parents/families in learning activities?

5. Does the content appear to be appropriate (level and language) for the target grade level(s)?

6. Are the content and associated activities presented in a way that students can have fun learning?

7. Does the material help develop reading, comprehension, math, and writing skills?

8. Is the approach balanced between encouraging independent thinking and presenting scientific/technical facts?

9. Do experiments and activities appear to be relevant, accurate, predictable, and suitable for the target grade level(s)?

10. Was the material pilot-tested? Have classroom teachers evaluated it? If so, how long was the pilot? When (at what point in the development process) was the pilot conducted? How many teachers were involved in the pilot?

11. Does the material include suggestions for student assessment activities to gauge student's knowledge and attitudes about the topic before and after the lesson(s)?

Equity/Diversity

1. Does the material contain descriptions and illustrations that show career options for various genders, races and ethnic group? Does the material avoid the use of stereotypes, caricatures, epithets, and dialect?

2. Was the material designed for use with students from a variety of socioeconomic, ethnic, and cultural backgrounds?

3. Do the content and illustrations depict rural and urban settings?

4. Are suggestions provided for adapting lessons and activities for students with physical disabilities (e.g., using Braille, audio tape, or captioned video tape) or from particular ethnic or cultural backgrounds without sacrificing the quality of the content presented?

5. Does the material offer opportunities to encourage the aspirations and achievements of women and minorities in environmental science?

6. If the material is designed for use in a specific area of the country, are the content and illustrations appropriate for that area?

7. If the material is designed for nationwide use, do the content and illustrations reflect geographic differences appropriately?

Cost and Practicality

1. Does the package contain a mast list of equipment and materials needed?

2. Are there suggestions for finding low-cost or no-cost alternatives for the equipment and materials needed?

3. Does it appear that teachers could use this material without additional training?

4. If is appears that teachers would need to be trained to use this material, is training provided by the developer or others? Is there any provision for continuing technical support for teachers - e.g., reference to a toll-free telephone number or a list of local/regional points-of-contact for questions concerning the materials?

5. Does it appear that lesson-related activities can be accomplished in an average classroom in the time specified?

6. Are materials easily reproducible? Can they be reused by another teachers?

7. Has the developer indicated how the material will be disseminated? If so, does the package include information on where replacements and updates can be obtained?

III. GUIDELINES FOR CURRICULUM MATERIAL DEVELOPMENT AND USE

A. Alliance for Environmental Education
Guidelines for Development and Use of Environmental Education Materials, Programs, Activities (No Date)

General considerations

Worthwhile and effective environmental education programs, activities and materials should:

Have clearly stated goals and objectives in terms of expected user behavior.

Treat controversial issues fairly and honestly, clearly identifying opinions or producer's policy.

Be concerned with helping users learn how to think, not what to think.

Not be used to sell products, agency policies, or single-interest points of view.

Be sensitive to human values and avoid racial, sexual, occupational, regional, and other stereotypes.

Development and Production of Materials

Effective educational programs and materials result when:

Those who will be using the materials are involved in the developmental process and design stage.

Clearly stated and measurable educational goals and objectives are established early in the developmental process with those who will be using the materials.

Products are designed to be compatible with ongoing educational activities, adopted courses of study, and curriculum frameworks and guidelines.

Allowance is made for user creativity and innovation.

Products are targeted to specific grade levels and subject matter areas.

Products are attractive, well-packaged, and convenient to use.

Test instruments and evaluation suggestions are provided.

Program Implementation

An effective implementation plan is needed if educational programs and materials are to be of maximum effectiveness. A good implementation plan:

Includes provision for instruction of those who will be using the materials.

Makes use of services available through professional associations, training institutions, state departments of education, and other agencies.

Evaluation

The value of programs and materials is determined by their effectiveness with users. Evaluation is, therefore, a key program element and should provide for:

> Field testing and evaluation of programs and materials in terms of stated goals and objectives by users prior to wide-scale implementation.
>
> Continuous feedback and modification as needed once a program is underway.

B. U.S. Department of Interior, Fish and Wildlife Service
Education and Recreation Standards: I & R Programs
Washington, DC (No Date)

Standard I.B.

> All education activities in Outdoor Classroom should be based on sound learning theory.

Setting Objectives

I.B.1. Are objectives written for outdoor classroom sessions or activities?

I.B.2. Are the objectives measurable?

I.B.3. Are the steps for accomplishing each objective identified in written lesson or activity plan?

Audience Identification

> Have the following characteristics of participants in Outdoor Classrooms been identified and incorporated into teaching techniques or content chosen for Outdoor Classroom activities:

I.B.4. numbers of participants in different age groups?

I.B.5. types of audience grouping (class, science club, etc.)?

I.B.6. the subject areas represented by participating classes or workshop (e.g., art, English, science, history)?

I.B.7. the educational levels of the groups?

I.B.8. the environmental awareness of class members or workshop participants?

I.B.9. physical or mental limitations or participants?

I.B.10. geographical origin of the group/class?

I.B.11. amount of time participants spend on site?

I.B.12. the amount of use (service-provided) environmental education materials have received by teachers and other professionals in education?

I.B.13. Is the staff familiar with the type and scope of EE in the public schools in the area?

Relating Program to Audience

I.B.14. Do learning activities or study topics recommended to Outdoor Classroom groups relate to their backgrounds and interests?

I.B.15. Prior to EE workshops, does the FWS staff person determine the educational backgrounds or interests of the participants?

I.B.16. Are the examples, terminology, and comparisons used in workshop presentation within the probable vocabulary and experience of the class members?

I.B.19. Is the historical perspective of current and potential resource problems a part of environmental education learning materials or activities used at the station?

I.B.20. Are environmental education learning materials available in a progression of levels from awareness of environmental concepts to development of skills necessary for active problem solving?

Are learning materials or activities available that:

I.B.21. identify and analyze attitudes and actions that have helped create resource problems in the area?

I.B.22. help students explore possible action they could take toward solving environmental problems?

I.B.23. identify and analyze the values involved in resource management decisions at the station?

Are learning materials, activities, or lesson plans available that help student practice the following problem-solving skills:

I.B.24. identification of environmental problems at the station?

I.B.25. collection of information about the field station environment?

I.B.26. analysis of information collected at the field station?

I.B.27. identification of alternate solutions to station environmental problems?

I.B.28. evaluation of possible effects of each alternative?

Involving the Audience

I.B.30. Do Outdoor Classroom learning activities involve students as active participants rather than spectators?

I.B.31. Do Outdoor Classroom learning activities involve the individual with the environment?

I.B.32. Is diverse sensory involvement a criterion for selecting learning activities for Outdoor Classrooms?

I.B.34. Are suggestions for action-oriented learning activities available for teachers to use in Outdoor Classrooms?

I.B.36. Are lesson plans or class activities available that involve subject matter from at least three disciplines (including one from the humanities)?

I.B.41. Do EE activities stress a "problem-oriented" approach rather than a "subject-matter" approach?

Creating Non-threatening Environments

I.B.42. Are service-provided learning materials free of religious, cultural, sexual, or ethnic biases?

I.B.44. Are teachers or other leaders using outdoor classroom sites warned of any potential safety hazards?

I.B.46. Are Outdoor Classroom learning activities structured to provide participants with some degree of success?

Standard II.B.

All interpretive activities should be based on learning theory and incorporate the principles of interpretation.

Setting Objectives

II.B.1. Are objectives written for each staff-led interpretive presentation, guided tour, or demonstration?

II.B.2. Do the above objectives state or include an expected outcome for each activity?

II.B.5. Are the objectives measurable?

II.B.6. Are the steps for accomplishing each objective identified in a written lesson or activity plan?

C. North American Association for Environmental Education
Environmental Education Materials Guidelines for Development - Second Draft
Washington, DC (1993)

Environmental Education activity guides, lesson plans, and other supplementary curriculum materials should have the following properties: They should...

1. Involve the learner in the educational process and focus on analysis and problem solving. Emphasis should be given to encourage the student to analyze issues and solve problems rather than on memorizing facts and concepts. Learning activities should focus on helping the student develop analytical skills and information collecting abilities within a community context.

2. Be factually accurate. Materials should reflect current, accepted theories and generally acknowledged facts about subjects and issues. Materials should have a conceptual focus with facts presented in a meaningful context. The materials should be reviewed by a spectrum of experts in the subject(s) covered. Reviewer comments and resumes should be kept on file and reasonable requests for review of such support materials should be accommodated when feasible.

3. Be educationally and conceptually sound. Research findings on learning styles, effectiveness of differing media and methods, etc., should be considered as materials are designed. User creativity and innovation should be encouraged and, when possible, activities should encourage responsible action in addition to basic awareness of facts and issues.

Experts on learning theory and other appropriate educational disciplines should be involved on the development team or asked to review drafts of materials.

4. Be unbiased and value fair. Where widespread differences of opinions exist on the topics covered, these differences should be included in the materials and opposing viewpoints presented as appropriate. Opinions should be clearly presented as opinions, not facts. The emphasis should be on enabling the learner to analyze issues and solve problems rather than on dictating a particular point of view. Materials should not be designed to support a particular viewpoint or policy or to sell products.

During the development of the materials, the opinions of proponents of the differing viewpoints covered should be actively sought and individuals holding differing viewpoints should have the opportunity to review and comment on the materials. Comments should be kept on file and reasonable requests for review of such support material should be accommodated when feasible.

5. Be free of cultural, racial, and gender biases. Gender specific pronouns and terms should be avoided and examples and illustrations should be diverse and representative of the general population. Educators and leaders of the diverse cultures in North America should be fully involved in the development and review process.

6. Be multidisciplinary and designed to augment and complement existing courses of study and curriculum frameworks. The scientific and technological aspects of the materials should be balanced with the human component and with disciplines such as social studies, history, geography, etc. The materials should integrate these disciplines easily into existing scope and sequences for the disciplines covered.

7. Have clearly stated and measurable outcomes. Materials should state expected learner outcomes in terms of behavioral objectives and suggest specific performance based assessments such as portfolios, open-ended questions, group or independent research or other appropriate projects to indicate mastery.

8. Be practical and easy to use. Development of the materials should include current classroom teachers on the development team and the materials should be pilot tested and used under conditions closely approximating their normal intended use with systematic formative and summative assessment included as part of the process.

The published materials should provide the following information in a clear, concise manner: intended audience/grade level, disciplines and concepts covered, intended learner outcomes, equipment needed, safety precautions if appropriate, time needed for activity, a brief overview of the activity, and instructions for conducting the activity. Instructions should be clear and specific, but the activity should include provisions for adapting procedures to local conditions and opportunities. Users should be able to easily correlate materials with state requirements.

9. Accomplish what they claim to accomplish. Claims for the efficacy of materials should clearly state their basis. If promotional information on materials is distributed, it should clearly differentiate statements concerning gains in learning from other statements about more subjective areas such as interest level and ease of use. Claims of positive learning outcomes should be substantiated by systematic assessment techniques rather than merely by letters of endorsement and anecdotal comments from users.

IV. A SYNTHESIS OF THE GUIDELINES: TOWARD A FRAMEWORK FOR ENVIRONMENTAL EDUCATION MATERIALS DEVELOPMENT STANDARDS

Looking at the various guidelines, no particular structure or model for the development of environmental education materials standards is readily evident. Some of the guidelines are listings of desirable attributes, while others have formed categories of guidelines, including technical content, material design, educational methods or pedagogy, presentation and organization, equity/diversity, and evaluation. Although there is no apparent consistency in organization, there is a great deal of overlap in terms of the content of the proposed guidelines.

Although perhaps a bit arbitrary, the guidelines developed here have been divided into seven themes: A) Learner Knowledge and Skills Base, B) Curriculum Design, C) Teaching Methods/ Pedagogy, D) Appropriateness for the Learner, E) Objectivity, Fairness, and Accuracy F) Teacher Friendliness/Presentation, and G) Assessment.

A. Learner Knowledge and Skills Bases

The guidelines in this category relate directly to the content of environmental education. That is, does the curriculum cover, directly and comprehensively, the various concepts and process skills inherent in environmental education. The guidelines are drawn directly from the proposed framework for national environmental education standards (see Working Paper #2) that outline what students should know and be able to do. Environmental education materials should teach about:

AFFECT

Environmental sensitivity or appreciation;

Attitudes: toward pollution, technology, economics, conservation, and environmental action;

Willingness to recognize and choose among differing value perspectives associated with problems and issues;

Motivation to actively participate in environmental improvement and protection;

Moral Reasoning: making decisions and judgments about environmental issues according to one's own sense of morality;

Values clarification.

ECOLOGICAL KNOWLEDGE

Communicate and apply the major ecological concepts including those focusing on individuals, species, populations, communities, ecosystems, biogeochemical cycles, energy production and transfer, interdependence, niche, adaption, succession, homeostasis, and man as a ecological variable;

A knowledge and understanding of how natural systems work, as well as of how social systems interface with natural systems;

Change and limiting factors (change as a natural process; biotic and abiotic limits to growth, size, and distribution of population).

SOCIO-POLITICAL KNOWLEDGE

Clear awareness of economic, social, political and ecological interdependence in urban and rural areas;

Understand and communicate how human cultural activities (e.g., religious, economic, political, social and others) influence the environment from an ecological perspective;

Understand the relationship between beliefs, political structures, and environmental values of various cultures;

Understand the basic components of societal systems;

Geographic understanding at the local, regional, and global levels;

Understand patterns of change in society and culture;

Understand structure and scale in societies and culture.

KNOWLEDGE OF ENVIRONMENTAL ISSUES

An understanding of the various environmentally-related problems and issues (local, regional, national, international, and global);

Air Quality (ozone depletion; global warming; acid deposition; air pollution);

Water Quality and Quantity (water pollution; use and management);

Soil Quality and Quantity (soil depletion and pollution; use and management);

Wildlife and Habitat;

Energy;

Land Use;

Human Population and Health;

Waste.

SKILLS

Identifying and defining problems;

The skills required to analyze, synthesize, and evaluate information about environmental problems/issues using primary and secondary sources, and to evaluate a select problem/issue on the basis of evidence and personal values;

Skills for dealing with action strategies: including selecting appropriate action strategies, creating an action plan, evaluating an action plan, and implementing an action plan;

Conducting basic risk analysis;

Thinking in terms of systems;

Using ability to forecast, to think ahead, plan.

DETERMINANTS OF ENVIRONMENTALLY RESPONSIBLE BEHAVIOR

Locus of control;

Assumption of personal responsibility (includes recognition that one's negative behavior has a negative effect on the environment and, likewise one's positive behavior can have potentially positive effects on the environment; acceptance of personal responsibility for negative environmental effects or impacts; willingness to help correct negative environmental impacts and resolve environmental impacts and issues).

ENVIRONMENTALLY RESPONSIBLE BEHAVIORS

Active participation aimed at solving problems and resolving issues;

Environmentally sound consumer purchasing (consumerism);

Methods for conserving resources (ecomanagement);

Assisting with the enforcement of environmental regulations (legal action);

Using personal and interpersonal means to encourage environmentally sound practices (persuasion);

Encouraging environmentally sound policies and legislative initiatives (political action).

B. Curriculum Design

This category outlines general guidelines related to the overall design of the curriculum: concept development, integration within the curriculum, use of vocabulary, and the development of learning skills. To a great degree, these guidelines should hold for any curriculum.

Does the curriculum have clearly stated goals and objectives in terms of expected user behavior?

Are the objectives measurable?

Is the content appropriate for achieving these objectives? Are the steps for accomplishing each objective identified in written lesson or activity plan?

Do the objectives appear to be consistent with national guidelines?

Is depth of understanding emphasized (rather than encyclopedic breath)?

Are ideas expressed through unifying themes and big ideas, not facts? Are ideas presented logically and connected through the curriculum?

Is the depth of treatment of the material adequate?

Are the concepts being taught related directly to the students' experiences?

Are means of assessing student's baseline understandings, skills and concepts at the beginning of the lesson included?

Are vocabulary words introduced and defined in context and not dominating of learning goals?

Are examples included in the text appropriate to the content, clear, and easily understood? Are they relevant to the learner?

Does the approach recognize the multi-disciplinary nature of environmental education, i.e. do lessons suggest tie-ins with other subject areas, such as the science disciplines, history, social studies, English, etc.?

Does the material help develop reading, comprehension, math, and writing skills?

Does it appear that lesson-related activities can be accomplished in an average classroom in the time specified?

Are products targeted to specific grade levels and subject matter areas?

Are instructional materials easy for students to use and understand?

Are the content and associated activities presented in a way that students can have fun learning?

C. Teaching Methods/Pedagogy

The guidelines in this category relate to the use of various instructional modes. The guidelines suggest that good environmental education takes advantage of what we know about good education. Consequently, these guidelines build off of instructional theory and our understanding of how best to create an effective learning environment.

Do the instructional materials offer opportunities for different learning modes?

Are a variety of instructional strategies, expanded learning environments, and resources suggested in the curriculum's design?

Is learning based on students constructing knowledge through research, discussion, and application to gain conceptual understanding?

Can the material be described as "hands-on" (interactive)? Does it include lots of examples and opportunities for student experience - for example, using music, art, poetry, and drama or involving parents/families in learning activities?

Is the learning environment expanded, using the out-of-doors, field trips, outside speakers, etc? Do learning activities involve the individual with the environment?

Is diverse sensory involvement a criterion for selecting learning activities?

Are group/cooperative learning strategies used?

D. Appropriateness for the Learner

Learning theory suggests that no one teaching/learning style will be appropriate for all students. Likewise, materials need to be both developmentally appropriate and relevant to the students and their learning. The guidelines here address the need for assuring that materials consider the diversity inherent in any particular audience.

Are important concepts conveyed in more than one way (visual, auditory, tactile), so that students who learn differently can understand them?

Are writing and concepts developmentally appropriate for the designated grade, yet sensitive to individual differences in educational experience and learning mode?

Does the content appear to be appropriate (level and language) for the target grade level(s)? Are the examples, terminology, and comparisons used in workshop presentation within the probably vocabulary and experience of the class members?

Are instructional materials sensitive to social, economic, and cultural diversity?

Are knowledge and learning shown as connected to students' lives and society?

Is the content presented in a way that students can relate it to their everyday lives? Is it relevant? If not, why?

Do experiments and activities appear to be relevant, accurate, predictable, and suitable for the target grade level(s)?

If the material is designed for use in a specific area of the country, are the content and illustrations appropriate for that area?

Are the materials relevant to both rural and urban settings?

Can the materials be adapted to varied learning environments (large/small classes, of mixed levels, from rural/urban settings)?

Is learning made accessible to LEP students?

Are materials available in more than one language?

E. Objectivity, Fairness, and Accuracy

Environmental education, almost by definition, involves the discussion of controversial issues. Consequently, it is particularly important that guidelines address the need for accuracy and objectivity in curricula. Likewise, as students explore the many sides of issues, they must be given the opportunity to examine and evaluate the values inherent in these issues. Additionally, issues directly related to multiculturalism must also be addressed in the examination of any set of curriculum materials.

Equity/Diversity:

Are the materials free of cultural, racial, ethnic and gender biases? Does the material avoid the use of stereotypes, caricatures, epithets, and dialects?

Have educators and leaders of the diverse cultures in North American been fully involved in the development and review process?

Was the material designed for use with students from a variety of socioeconomic, ethnic, and cultural backgrounds?

Does the material contain descriptions and illustrations that show career options for various genders, races and ethnic groups?

Are suggestions provided for adapting lessons and activities for students with physical disabilities (e.g., using Braille, audio tape, or captioned video tape)?

Do the content and illustrations depict rural and urban settings?

If the material is designed for nationwide use, do the content and illustrations reflect geographic differences appropriately?

Accuracy/Fairness:

Are the materials factually accurate? Do the materials reflect current, accepted theories and generally acknowledged facts about subjects and issues?

If there are scientific/technical differences of opinion or competing theories on a topic, are the differences identified and presented in a balanced way?

Do lessons promote respect and caring for the environment, yet are nondogmatic and open to inquiry and differences of opinion?

Are individual values included, as they pertain to the subject?

Does the design encourage (provide tools for) teachers to allow students to investigate and discuss issues and to form and express opinions about the responsibleness of competing theories? (For example, there are valid scientific arguments that production of greenhouse gases will result in global warming and equally valid arguments that they will result in global cooling.)

Are the materials concerned with helping users learn how to think, not what to think?

Is it clear that the materials are not being used to sell products, agency policies, or single-interest points of view?

During the development of the materials, were the opinions of proponents of the differing viewpoints covered actively sought and did individuals holding differing viewpoints have the opportunity to review and comment on the materials?

Have the materials been reviewed by a spectrum of experts in the subject(s) covered? Have reviewer comments and resumes been kept on file and are reasonable requests for review of such support materials accommodated when feasible?

F. Teacher Friendliness/Presentation

Curricula materials are designed to be used. However, what seemed obvious to the designer may not be quite so obvious to a classroom teacher hundreds of miles away. Attention needs to be paid to the presentation of curriculum materials and the degree to which they meet the real world needs of teachers.

Is the structure logical, i.e., would the overall purpose, direction, and logic of the presentation be clear to teachers and students?

Are instructional materials clearly and engagingly written with the main concepts well articulated?

Is the layout of instructional materials interesting and appealing?

Are instructions for teachers clear and concise?

Is background information for the teacher adequate and accurate?

Is the time required to complete each lesson indicated?

Do the materials clearly list the subject discipline(s) integrated into each lesson?

Are the materials organized in an easy-to-use fashion?

Are student materials sufficiently supplied?

Are consumable instructional materials of good quality, easily duplicated for student use, and in sufficient quantity to support the objectives?

Are materials easily reproducible? Can they be reused by another teacher?

Are there suggestions for finding low-cost or no-cost alternatives for the equipment and materials needed?

Does the package include information on where replacements and updates can be obtained?

Are equipment/materials listed and reasonably accessible?

Are there suggestions for further investigations?

Are there good visual illustrations?

Are maps, graphs, and charts useful, clear, and easy to read? Are photographs sharp and clear?

Does it appear that teachers could use this material without additional training?

Is the material attractively packaged? Would it be easy for teachers to keep and use - for example, loose-leaf, 8.5" x 11", 3-hole punched, able to lie flat on the desk, easily reproducible?

Are any safety precautions included?

Have the materials been or are they easily correlated with state requirements?

G. Assessment

Finally, how will a teacher, parent, or administrator know whether the curriculum does what it claims to do? Building some method of assessment directly into the curriculum has become an essential element if there is an expectation that the curriculum will be adopted and used on an on-going basis.

Does the curriculum have clearly stated and measurable outcomes?

Do the materials state expected learners outcomes in terms of behavioral objectives and suggest specific performance based assessments such as portfolios, open-ended questions, group or independent research or other appropriate projects to indicate mastery?

Will the materials accomplish what they claim to accomplish? Have claims of positive learning outcomes been substantiated by systematic assessment techniques rather than merely by letters of endorsement and anecdotal comments from users?

Were the materials field tested and evaluated in terms of stated goals and objectives by users prior to widescale implementation?

Has the program provided for continuous feedback and modification as needed once the program is underway?